JULY
POPULAR
MECHANICS
MAGAZINE
WRITTEN SO YOU CAN UNDERSTAND IT
REG'D. TRADE MARK, GREAT BRITAIN, No. 410426
$112,600
FOR YOUR IDEAS
SEE PAGE ONE

e an Auto and lectrical Expert

McSweeny Trained Men in Demand at $40 to $150 a Week

Here's one instance of the success McSweeny Training has brought thousands of men:

George W. Smith, West Alexandria, O., has earned over $800 a month ever since he finished his training. He now owns his own garage and auto agency. When Smith came to me he knew nothing about autos. In eight weeks my methods made a big-money man out of him. And there's no reason why any boy can't do just as well.

ll Pay Railroad Fare to Either School and Board You for My Full 8 Weeks Term

I get calls every day from garages, battery stations, auto factories and so on, for McSweeny-trained men. Albert Boyer, of Alexandria, Ky., is only 19 years old, but has been making a big success in his own business. He says my training made him win out. To fill the calls on me for trained experts, I'm making this wonderful offer for a short time. I'll pay your railroad fare to Cincinnati or Cleveland, and board you for the full eight weeks.

In 50 Days You're Ready to Command a Big Pay Job

13,000,000 Autos and 1,000,000 Tractors must be kept running. Spend 50 days in my great shops and no job will be too hard for you. Big wages and steady work certain. "McSweeny training made me Chief Mechanic of a big plant in three months," writes Fred Pendley, Blowing Rock, N. C.

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Every one of my students receives a complete course in practical electricity. He learns ignition, starting, lighting, power plant and generator wiring—all by the same work-shop jobods which teach him all about carburetors, transmissions, vulcanizing, battery construction and repair. He is in 50 days to tackle any machine, in any condition, and "put it on its feet".

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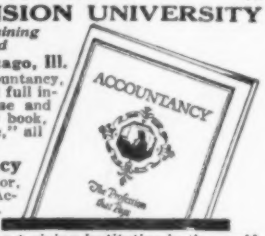

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Name.....

Present Position.....

Address.....

Henry Haven Windsor, Sr.

NOVEMBER 13, 1859 MAY 11, 1924

In Memoriam

HENRY HAVEN WINDSOR, founder of Popular Mechanics Magazine, which stands today as a living tribute to his genius, died Sunday, May 11, at his home in Evanston, Ill., after a short illness.

Born in 1859, his early schooling was received at Marshalltown, Iowa. At the age of twelve he assembled his own printing press and devoted most of his time after school to its operation. When he left high school, he worked in the village postoffice and contributed articles to the Chicago newspapers until he entered college.

Afterwards, he became city editor of the Times Republican, of Marshalltown. In 1883, he came to Chicago and was soon secretary of the Chicago City Railway and founder of the Street Railway Review. This inspired the desire to establish a magazine giving scientific news in simple language. As he himself expressed it:

"I started Popular Mechanics Magazine twenty-three years ago with the idea primarily in mind that it should be a magazine of education, and that while up to that time there was practically nothing of a technical nature set forth in plain, simple language, in other words, 'written so you could understand it,' I hoped to accomplish that very thing."

To this ideal of his magazine he gave his love and his life. He gave his work in a spirit of worship and spent his magnificent strength without stint in its service. From a struggling weekly, he watched it develop into a monthly with a world-wide circulation and saw it occupying its own home which is known as one of the most complete plants of its kind in the world.

Drawing upon a seemingly inexhaustible store of energy, vitality and enthusiasm, editorship with him did not consist merely of inspiring or directing the work of others, although he did that surpassingly well. He was a powerful and forceful writer. He thought simply and hated pretense. He wrote simply and loved the truth. His last editorials written just before his illness are printed in this issue on pages forty-six to forty-eight. His ready sympathy, helpful understanding and contagious enthusiasm were an inspiration to all who came in contact with him.

The greatness of his mind, the modesty of his heart, the integrity of his spirit lived with him. But they will not die with him. They are preserved as a bright tradition among those who had the honor of working with him and for those who will come after.

During later years Mr. Windsor's responsibilities have been largely shared by H. H. Windsor, Jr., his son and successor, who through his intimate contact with his father's work for so many years will continue to carry forward the ideal to which the magazine is dedicated.

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 42 JULY, 1924 No. 1

Over $112,600 Offered for Your Ideas

Manufacturers, Inventors and Leaders of Public Opinion Unite in Praise of Industrial Award Plan

Copyright, 1924, by H. H. Windsor

WITH additional offers received since the first announcement a month ago by Popular Mechanics Magazine of the Industrial Award Plan raising the total to more than $112,600, manufacturers, leaders of public opinion, inventors and editors in all parts of the country have united in unqualified endorsement of the project. "After careful reading of your plan to foster the spirit of invention by closer co-operation between industry and the inventor, I have no hesitance in expressing the belief that it is not only sound and practical in every way, but that it is something which is very much needed to keep our nation abreast of the developments which are taking place in other countries," writes James Ashton Greig, editor of Electric Traction.

"We believe that this method of bringing manufacturers' problems before the public for their assistance in the solution is a great step in advance, and there is no doubt but that a great deal of good will be obtained through this effort on your part, not only to the manufacturers interested, but also to the public in general, through better products and cheaper costs," declares J. E. Otis, Jr., vice president of the Bassick Manufacturing company.

"The Plan evolved by Popular Mechanics Magazine for bringing together world-wide talent to solve the problems of the day is strikingly bold and most laudably commendable," writes John J. Harris, of John J. Harris and company. "Today, as always, to bring meritorious effort into full play, interest must be aroused to achieve results and this your Plan, in providing for a share in the reward, fully promises. Nay, more, it promises results far beyond the ability of the mind to conceive for it will be the means of concentrating latent thought and ability in your readers which will be the base of solving many problems, even beyond the reach of your international magazine, by adding zest to the spirit of accomplishment.

"The unselfish, practical, well directed and laudable nature of your enterprise, at once so apparent, forecasts a success in your aims at least as great as was the motive and ability which inspired the thought and is carrying it into being. You have stimulated the light of invention and from its manifold rays will reap enjoyment." "Allow us to congratulate you on a unique and clever idea—it is most excellent," declares D. J. Benoliel, of the International Chemical company, Philadelphia. "It looks as though you are surely going to create a great deal of interest and it is quite in the cards that some of these problems can be solved through the enterprise of your magazine," says Benjamin Jefferson, of Lyon and Healy, Chicago. Genius itself may not be so very rare. Practical folks define it as a capacity for hard work. But

Forerunner of the Popular Bicycle, a Model Faithfully Reproduced from Old Drawings for Use in a "Movie" Production

Marking Packing Box with Self-Heating Branding Iron That Burns Vaporized Gasoline It First Superheats

Measuring Mandolin Tops on Scale Which Records Thousandths of an Inch

Trimming Edges of Chamois Bag Used in Gasoline Strainer for Automobile Engines

Joining Steel Fan Blades to Circular Frame with Electric Spot Welder That Melts the Two Parts Together

Getting Ready to Lift a "Heat" of Molten Brass Mixed in an Oil-Blast Furnace

many who have toiled as intensively as Edison or Steinmetz have died in obscurity because their efforts have been directed along non-productive lines. It is to eliminate this wasted effort, to point out the broad highway of constructive achievement, that the Industrial Award Plan was conceived. Take the case of Charles Proteus Steinmetz, whose experiments made to ascertain the effect of lightning on electric currents caused millions to doubt if Jove had done anything wonderful. He came to America a penniless emigrant with a giant brain joined to a frail, deformed body. The suggestions that later resulted in the amazing development of mechanical power, in countless forms and on a stupendous scale were received by him at a meeting with a pioneer worker in the field of applied electricity. History records that some of the greatest inventions have come from persons having little or no technical knowledge or training. Whitney had never seen a bale of cotton before he paid a visit to the south that resulted in his invention of the cotton gin. Prior to that time he did not know that any such problem existed. But when it was outlined to him, the solution was easy. He was not handicapped by the knowledge that "it can't be done."

Seeking Chemical Solutions for Moisture-Proof Paste, and Center, Workman Inspecting Banjo, All Metal Parts of Which Are Goldplated

Putting Electric Light Sockets Together in Factory Where They Are Made; They Are Then Assembled into Clusters

So do not hesitate to send in your ideas for the solution of the problems outlined below. The manufacturer can work out the technical details in most cases. What is wanted is ideas. Other problems will be outlined in following issues.

Yellow Cab Manufacturing Co.

No. 1—$50,000—Traffic Safety

The Yellow Cab Manufacturing Company, supplying vehicles to 815 yellow cab operating companies in the United States, offers an award of $50,000 for a perfected plan, including regulations, mechanical devices, etc., for the promotion of greater street safety in the cities of this country. This offer expires May 1, 1925.

The plan of traffic and pedestrian correction and regulation must be of such caliber as to recommend its adoption by at least two of the six largest cities of the United States and must have basic qualities suitable for improvement of traffic management in cities of any size. The successful solution must materially supplement any suggestions grouped in such comprehensive traffic plans as have been made public before the first publication of the present offer. Address Yellow Cab Manufacturing Company, 5801 West Dickens Avenue, Chicago, Illinois.

Lyon and Healy, Inc.

No. 2—$10,000—Musical Instrument

Lyon and Healy will undertake the manufacture of an entirely new and original design of musical instrument that can be made in their piano factory, banjo and guitar factory or their band instrument factory. The design may be very simple or it may be an elaborate one. It must be a genuine musical instrument to be considered and must be such that it will be welcomed into the ranks of orchestra or brass band players. To the inventor of an instrument which gains the indorsement of this organization, the donor offers the following terms: They will enter into a contract to make and sell the instrument and will award the inventor royalties from the sales until such time as the royalties aggregate the sum of $10,000, when they shall cease and the instrument and all patents covering same shall become the sole property of Lyon and Healy, incorporated.

No entrants connected in any way with Lyon and Healy will receive any consideration in this offer. The instrument must be submitted as a working model, so the committee can judge of its value as an addition to the present family of musical instruments. No ideas, plans, sketches or blueprints will receive consideration. We must have a playable model. This offer ends May 1, 1925. Examining committee will consist of W. F. Kirk and H. H. Windsor, editor of Popular Mechanics Magazine. Address W. F. Kirk, 4110 Fullerton Avenue, Chicago, Illinois.

Everhot Manufacturing Co.

No. 3—$500—Mechanical Improvement

The Everhot Manufacturing Company, making a gasoline-heated blowtorch and soldering and branding iron combined, will pay $500 for the best suggested improvement on its product that meets the requirements and is adopted by this concern.

No. 3A—$200—Best New Use

This firm will also pay $200 for the best suggested new use received before May 1, 1925, the date these

offers expire. In addition to the above, cash payments, in proportion to their value to us, will be given for all suggestions having reference to the production, distribution, and use of our products, not already known to us, and which we will adopt. Address Everhot Manufacturing Company, Maywood, Illinois.

Problem Number AM-1

No. 4—$500—Preventing Waste of Zinc

In operating a brass foundry there is a considerable loss of zinc at the furnaces. Zinc oxidizes freely and while being melted, oxidizes and passes off in the form of a white cloud in the air. It is obnoxious to workmen and frequently causes illness. The loss of zinc that escapes thus is variously estimated at from three to ten per cent. If any way could be devised whereby this zinc oxide could be saved and reduced to the metallic state again, it would mean a great gain. This donor will pay $500 for a practical solution of the problem, and one which they would adopt. This offer will end May 1, 1925. Address Problem Number AM-1, Popular Mechanics Magazine, Chicago, Illinois.

No. 4A—$100—Disposal of Leather Waste

In the manufacture of leather belting there is considerable waste left after the leather is trimmed preparatory to being made into belt. This consists of pieces about as big as a man's hand and narrow strips cut from the sides. It formerly was used in manufacturing whips and fly nets for horses and in heels of shoes, but other methods and processes have done away, in a great measure, with these demands for the material. For a plan by which this waste product could be disposed of at a reasonable price to the maker of leather belting, this donor will pay the sum of $100 in cash. May 1, 1925, is the closing date for the offer. Address Problem Number 4A, Popular Mechanics Magazine, Chicago, Illinois.

John J. Harris and Company

No. 5—$1,000—Waterproofing and Sales

This concern makes paste known as "Bull Grip" having practically universal application as an adhesive. It can be used as a library paste, a glue, a cement and a mucilage. The adhesive and cohesive properties of the compound are exceedingly strong. It will cause a thin strip of metal to adhere so strongly to a piece of wood that it will sustain the weight of several hundred pounds, and will cause like substances to cohere powerfully. We desire the best way to market the product in wholesale quantities among manufacturers who can make use of it. We also wish an economical method of making the paste waterproof.

John J. Harris and Company will pay $500 for a solution for each of these problems accepted by them, and which is received prior to May 1, 1925, when the offer will end. Address John J. Harris and Company, 4035 West Kinzie Street, Chicago, Illinois.

Benjamin Electric Mfg. Co.

No. 6—$250—Making Electric Stand Lamps

For the most practical and workable method, as determined by our engineering department, by which Benjamin stand lamp clusters can be anchored to standard forms of vases, urns, etc., including covering and finishing of openings, thus converting them to electric stand lamps, we shall pay $250.

No. 6A—$150—Lamps from Old Vases

For the most practical and workable method, as determined by us, of attaching Benjamin stand lamp clusters to vases, urns, etc., with the aid of ordinary materials usually found among stocks of electrical contractors and lamp dealers, $150 will be paid.

Thomas A. Edison in His Younger Days with One of His First Designs of the Talking Machine

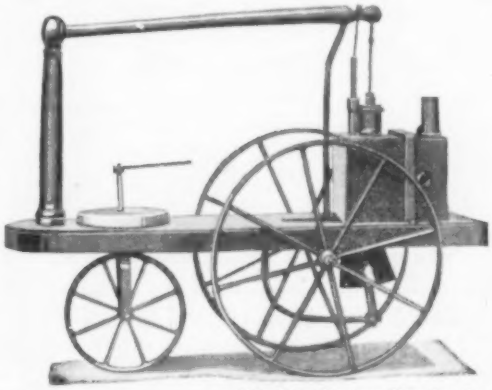
No. 6B—$100—Advertising Plan

For the best scheme or method by which electric lamp dealers can stimulate the business of converting vases, urns, old lamps, etc., to modern electric lamps, using the Benjamin stand lamp clusters, we shall pay $100. This calls for a workable, concrete sales promotion idea which will attract customers desiring old vases, etc., made into electric lamps. These three offers close May 1, 1925. Address, Advertising Dept., Benjamin Elec. Mfg. Co., 847 W. Jackson Blvd., Chicago, Illinois.

Problem Number LR-2

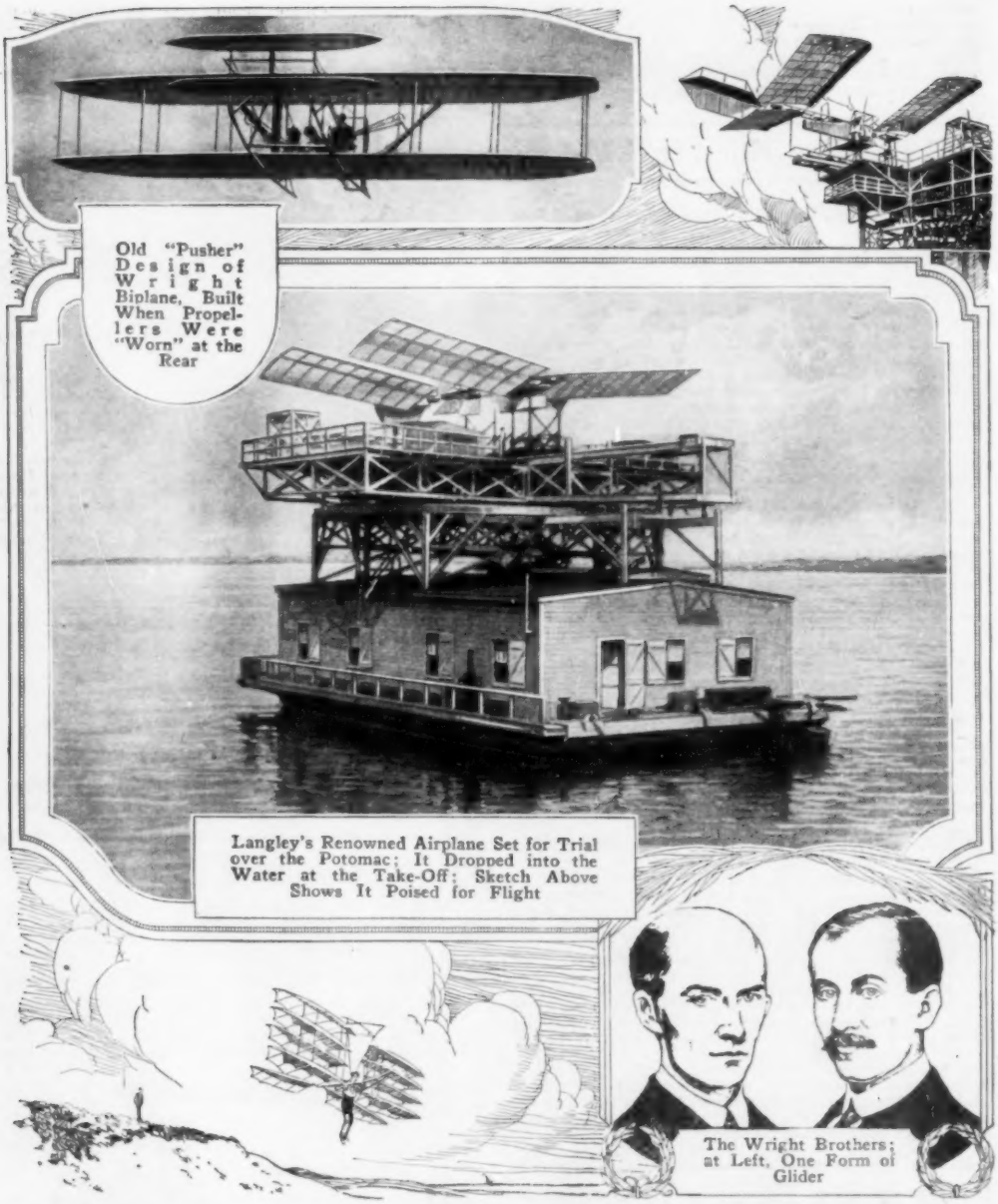
No. 7—$5,000—What Shall We Make?

A splendidly equipped factory manufactures bent wood rims similar to those on wheels of bicycles. Facilities and special machinery permit of a large increase over our present production. We can manufacture in sizes from 14 inches to 25 inches out-to-out diameter, and in cross section, any shape that can be made from 1½ inches wide and ¾ inch thick. Possibly someone could invent a product in which these rims could be incorporated or an existing product could be improved to use these rims. For a bona fide plan or proposition



Copyright, Keystone View Co., Inc.

Miniature Reproduction of First Locomotive in England, Built by William Murdock, Inventor of Coal-Gas Light



Old "Pusher" Design of Wright Biplane, Built When Propellers Were "Worn" at the Rear

Langley's Renowned Airplane Set for Trial over the Potomac; It Dropped into the Water at the Take-Off; Sketch Above Shows It Poised for Flight

The Wright Brothers; at Left, One Form of Glider

that will solve our problem and one that we would adopt, we shall pay $5,000 when the idea has proved successful and satisfactory within a reasonable time. Offer expires May 1, 1925. Address Problem Number LR-2, Popular Mechanics Magazine, Chicago, Illinois.

Ilg Electric Ventilating Co.

No. 8—$5,000—Uses for Ventilating Fans

We will pay a total of $5,000 for ideas suggesting novel and practical uses of Ilg motor propeller fans with automatic shutters, Ilg blowers and Ilg unit heaters.

In paying for suggestions their value will be determined by novelty, and usefulness; the more widely the suggestion can be used, the more we shall pay for it. The amounts to be paid for suggestions will probably range from $100 to $1,000. All suggestions will be looked over carefully and those that cannot merit payment will be returned; those adopted will be paid for promptly. We will be sole judges in determining the suggestions that are useful and their value to us. Offer ends May 1, 1925. Address Ilg Electric Ventilating Company, 2850 North Crawford Avenue, Chicago, Ill.

Jahn & Ollier Engraving Co.

No. 9—$500—What Is "Relief" or "Dry Effect"?

Frequently on plates developed in pyro-soda, photographers find shadows raised in relief. This occurs more

with wet plates, than when making a Velox print. A piece of glass is coated with albumen so the film will not wash off the plate, and left to dry. Then it is covered with collodion, which "sets," and is put into a silver nitrate bath to sensitize. Exposure is made while the plate is wet, and after washing, it is "fixed" in a cyanide of potassium bath to clear away undeveloped silver.

After fixing, it is intensified by immersion in a solution of sulphite of copper, washed and placed in a nitrate of silver solution. (Some claim this operation is the cause of dry effect.) Following intensification, the negative is bleached with a solution of iodine made soluble with iodine of potassium and water. It is then cleared in a weak bath of cyanide of potassium to bring out the tones. Washing, and bleaching with sodium sulphide follows. Some such negatives are treated with a solution of mercury and blackened with ammonia sulphide, washed, and a weak mixture of nitrate acid used to clear any stains left by ammonia sulphide. A solution of rubber dissolved in either benzol or gasoline is applied after the plate dries. Over this a coating of collodion is placed, which consists of alcohol, ether, gun cotton and castor oil. The film is separated from the glass by immersing in water for a few minutes. It is then stripped to a glass plate and printed on sensitized copper. It is here that the dry effect shows. For a process that will eliminate "dry effect" successfully, we will pay $500.

No. 9A—$500—Color Separation

A cover of this magazine is reproduced in four-color process from an original water-color drawing. The inks used in printing are yellow, red, blue and black, requiring four different plates. When photographing the original drawing, filters are used in front of lenses to separate colors. For the yellow plate, a purple filter is used to eliminate blues, purples and magenta reds and to emphasize yellows, orange and yellow green. An orange filter is used for the blue plate to strain out all red, orange and yellow and to strengthen blue, green and cold colors. Greenish yellow filters are employed to make black plates, eliminating a little of all colors and emphasizing blacks or near blacks. Last, for the red plate, a green filter is used, eliminating green and near green and giving strength to red, pink, deep orange and violet. Dry plates and emulsions have not proved entirely satisfactory, especially for the plates and filters for the red. We will pay $500 for a perfect improvement on these processes.

No. 9B—$500—Etching Process

In making a halftone plate our greatest problem is to get a true and absolute photographic reproduction of the copy. By staging and fine etching, you could turn out a more or less mechanical reproduction and lose photographic values. A high negative could be made and staging done away with, but you would lose in the middle tones and light middle tones, and again lose copy value. If we could turn out a finished plate and a true reproduction of copy, in a one-depth "bite" (of the etching acid), it would result in a great saving in present cost. Offers 9, 9A and 9B expire May 1, 1925. For such a process, we will pay $500. Address Jahn & Ollier Engraving Company, 554 West Adams Street, Chicago, Illinois.

The Imperial Brass Mfg. Co.

No. 10—$500—Electric Iron Attachment

Design—An electric heating element that will operate successfully and interchange with the base and cover of the Imperial self-heating gasoline iron. For an accepted design we shall pay the designer $500. The Imperial Brass Manufacturing Company will arrange to send entrants irons at factory cost and refund such deposit, if and when the iron is returned in perfect condition, within a reasonable time. The closing date of this offer is May 1, 1925. Address Imperial Brass Manufacturing Company, 1200 West Harrison Street, Chicago, Illinois.

Bassick Manufacturing Co.

No. 11—$100—Chamois Skin Waste

In cutting out chamois skin pieces for use in our gasoline strainer, scraps are left after trimming the center from sheets averaging about 6 by 12 inches square. We will pay $100 for a plan, process or method of profitably disposing of these scraps, adopted by us. Offer ends May 1, 1925. Address Bassick Manufacturing Company, 2650 North Crawford Avenue, Chicago, Ill.

Liquid Carbonic Company

No. 12–$1,000–Additional Uses of Product

The Liquid Carbonic Company will pay $1,000 for the discovery of a new use for carbon dioxide gas or for improvements to present uses that will produce for the company additional gas sales of at least 200,000 pounds a year.

No. 12A–$1,000–Freeze-Proof Soda Cooler

This concern will pay $1,000 for an automatic freeze-proof soda or water cooler for soda fountains, this cooler to have sufficient capacity to care for average two-hour peak load of fifteen gallons of water and soda per hour and to be proof against freezing during normal overnight no-load periods. This cooler must be adaptable to either the so called "iceless" type or mechanically refrigerated soda fountains where the cooling will be derived from liquid medium at average temperature of ten degrees above zero. All designs subject to sole judgment of this company. Both our offers will end May 1, 1925. Address Liquid Carbonic Company, 3100 South Kedzie Avenue, Chicago, Illinois.

National Lumber Mfrs.' Assn.

No. 13—$2,000—Salvaging Waste

The united lumber industry through its agency, the National Lumber Manufacturers' Association, offers an award of $2,000 in a series of payments for the best, most constructive and most practical suggestions for salvaging the lumber which, for one reason or another, drops out of sight and is lost somewhere between the time the tree is cut and the time the lumber reaches the consumer. All entries must be in hand before March 1, 1925, the closing date of the offer. Address National Lumber Manufacturers' Association, Washington, D. C.

Thearle-Duffield Fireworks Co.

No. 14—$1,000—Harmless Skyrocket Stick

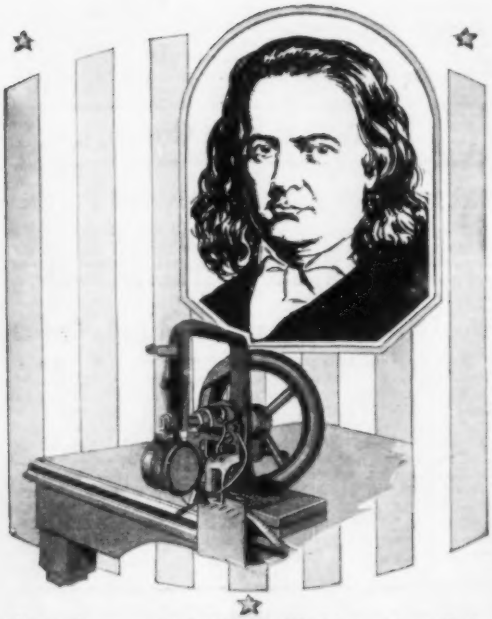
The Thearle-Duffield Fireworks Company, producers of fireworks displays and spectacles, will pay to the designer of a skyrocket equipped with a stick absolutely harmless in its descent after explosion in the air, the sum of $1,000. Models or clearly defined ideas are acceptable to this company, who will be the sole judge of the article and its value to them.

No. 14A—$250—Bombshell with Illuminated Flag

This concern will pay the sum of $250 for a satisfactory night bombshell that will release, at an altitude of 600 to 800 feet, a large silk American flag attached to a parachute together with an illuminating compound that will function in such a manner as to safely and satisfactorily illuminate the flag so that it may be clearly seen as it floats in the air.

No. 14B—$250—Smokeless Colors

For a combination of chemicals that will produce smokeless, or nearly smokeless, colors when burning, the Thearle-Duffield Fireworks Company will pay the sum of $250. The colors produced are to be in solid reds, blues, yellows, greens and white. The main object is to secure a smokeless combination that will prove acceptable to this organization. All of the above offers close May 1, 1925. Address Thearle-Duffield Fireworks Company, 624 South Michigan Avenue, Chicago, Illinois.



Howe, Inventor of the Sewing Machine, and an Early Working Model of His Device

R. L. Barker and Company

No. 15—$10,000—Motor-Operated Handsaw

With the person who designs a successful and acceptable means of motorizing the ordinary handsaw, R. L. Barker and Company will enter into an agreement to manufacture and market such device and award to the inventor royalties from the sales until such time as the royalties aggregate the sum of $10,000, when the payments shall cease and all rights to and ownership of the implement will pass to R. L. Barker and Company. The saw must be of the reciprocating type. We have in mind three sizes; one driven by a ½-hp. motor, with 16-inch blade, 14-inch stroke, to cut 12-inch timbers, and weighing about 25 pounds; another driven by a ¼-hp. motor, with 6 or 8-inch blade, with 4 or 5-inch stroke, to cut 4-inch timbers; this would be the most popular size, selling in almost every field where handsaws are used. The third size should take a smaller motor, about a 4-inch blade with stroke of 2 or 3 inches, to cut very light materials, such as veneer and wallboard, or for shaping showcards and stage scenery. The difficulty in properly designing the implement, it seems, would be to get uniform pressure on the saw blade while it is being drawn back and forth by the motor. R. L. Barker and Company will be the only authority to judge of the suitability for their purpose of all designs submitted. This offer will terminate on May 1, 1925. Address R. L. Barker and Company, 642 West Washington Street, Chicago, Illinois.

Keasby and Mattison Co.

No. 16—$500—Sales Promotion Plan

The Keasby and Mattison Company has a neutral product which is very light and fluffy, and of use as an absorbent, as a non-heat-conducting powder, as a neutral powder to be mixed with arsenite of lead or other insecticides, or for any sort of disinfectant, for air supplying, dusting, etc. We desire a price of about three cents a pound for this material. It is mainly of a very light and fluffy chalk and is exceedingly bulky. A large sugar barrel can be made to hold about 100 pounds of the powder, 95 per cent of which will pass through a 400-mesh screen. For a satisfactory plan that will aid in largely increasing our sales of, and assist us in marketing, the product, we will pay the person submitting the plan, the sum of $500, Keasby and Mattison Company alone to determine the value of the method. The offer will end on May 1, 1925. Address Keasby and Mattison Company, Ambler, Pennsylvania.

Aetna Industries, Incorporated

No. 17—$15,000—Mechanical Improvements

The Aetna Industries, Incorporated, manufacturers of mechanical and labor-saving appliances, such as automatic oil burners, camp stoves, rivet heaters, illuminating lamps, portable shower baths, burglar-proof window locks, lawn sprinklers, rotary pumps for air and liquid, and hand drills for steel, iron, etc., will undertake the manufacture of an entirely new and original device either in the line of their own products aforementioned or any other labor-saving devices, mechanical or electrical, that are practical and will gain the endorsement of this organization. To the inventor submitting such article, this concern offers the following terms: They will enter into a contract to make and sell the new or improved device and award to the inventor royalties from the sales until such time as the royalties will aggregate the sum of $15,000, when payments shall cease and the improved or new device shall become the sole property of the Aetna Industries, Incorporated. No person connected with this concern will receive any consideration under this offer. All ideas must be submitted in form of models, as no sketches, plans or blueprints will be accepted. Examining committee will be R. S. Brandt, president, A. Pettersson, vice president, of this organization, and J. J. Berggren, technical superintendent of the Essanay Film Manufacturing Company. The offer closes May 1, 1925. Address Aetna Industries, Incorporated, 117 North Dearborn Street, Chicago, Illinois.

Gemco Manufacturing Co.

No. 18—$250—Article for Manufacture

The Gemco Manufacturing Company will pay the sum of $250 in cash to the person submitting to them a fairly well developed article that can be manufactured in an ordinary general metal-working plant equipped with a line of medium-heavy punch presses, screw machines, automatic machinery, polishing and plating departments, and complete tool and diemaking and experimenting departments, etc. This also applies to the one submitting a suggestion that leads to the acquirement of such article by this concern. We are in search of some good live accessory to manufacture and sell to the automotive trade, or an article that will market readily through the hardware trade and which may be applicable to almost any field—to the farmer and any other large class of users. Value of the article to us will be determined entirely by members of our organization, and its merits will be largely measured by its adaptability to our sales organization. The award, as offered here, means a payment over and above any agreements into which we might enter with an owner of the rights to such accepted article for manufacture in case he is the one to submit the idea we adopt. Our offer will be closed on May 1, 1925. Address Gemco Manufacturing Company, Milwaukee, Wisconsin.

Problem SC-1

No. 19—$25—Leakproofing Cast Iron

This donor will pay the sum of $25 in cash for a satisfactory, simple and inexpensive method by which they can make cast-iron vessels, about 4 inches wide, 9 inches deep, and of ⅛ to 3-16-inch metal, proof against leakage of kerosene. It seems that the metal is open sufficiently in the grain to allow seepage, and so far

their efforts to apply a coating on the inside of the vessel to close the pores and resist the action of the kerosene have been unsuccessful. Their offer expires May 1, 1925. Address Problem SC-1, Popular Mechanics Magazine, Chicago, Illinois.

The Stieff Company

No. 20—$1,000—Untarnishable Silver

The Stieff Company, silversmiths, will pay the sum of $1,000 in cash for a perfected process or method whereby finished silver can be coated by some transparent material of a permanent and satisfactory character which will not in any way detract from its appearance or use and which will prevent tarnish. Or, the plan may be such that some alloy could be introduced into the composition of the metal which will not be detrimental to its quality, appearance or use, and yet will permit it to retain a fixed and permanent brilliance and luster absolutely immune to tarnish. The plans, methods, and processes submitted must necessarily be proven by qualified tests and demonstrations on the part of our concern, and the one selected by us must be only of such character as will warrant its adoption. This offer will terminate May 1, 1925. Address The Stieff Company, 17 North Liberty Street, Baltimore, Maryland.

Buescher Band Instrument Co.

No. 21—$1,000—Saxophone Reed

The Buescher Band Instrument Company will pay the sum of $1,000 in cash to anyone who will produce for them a reed for a saxophone that will give the same results as the present reed but which must be indestructible in so far as ordinary care is concerned. This idea has received a great deal of attention in the past from many people, but nothing has been developed to satisfactorily replace the present cane reed. All kinds of metal, ivory, wood, rubber, celluloid, and other ma-

HERE IS THE PLAN

1. All offers of awards made, and all solutions of problems submitted, are subject to these terms and conditions, except where they are in conflict with or modified by the terms of the offer. In that case the offer controls.

2. The one offering the award is hereinafter called the "Donor," and the one submitting a solution the "Entrant."

3. All proposed solutions shall be mailed or delivered as directed in the offer.

4. The donor shall pay the award to the entrant who submits a solution of donor's problem which is complete, practical and economically sound and satisfactory, to, and not already known to, the donor.

5. The donor shall have the period of one year from the receipt of any proposed solution to pass upon it, and, in case it be regarded as a partial solution, to agree with the entrant as to the amount of the award. During that one-year period the entrant shall not offer or submit said solution, or any part thereof, to any one else.

6. If the donor shall not have paid the whole or any part of the offered award mutually satisfactory to any entrant within said one-year period, unless entrant agrees to an extension of time, the donor shall return to such entrant by mail the solution submitted by him. If the entrant had the right to submit such solution, donor shall make no use of such or the information given, provided, however, that nothing herein contained shall prevent the donor from using any solution, idea, device or information which donor knew about and had the right to use before the receipt by the donor of such entrant's solution.

7. Any patent on, or any patentable feature of any entrant's solution accepted and paid for as herein provided, shall belong to the donor, and entrant shall assign to the donor any such patent already issued and any invention for such a patent on which applications shall have been made. And entrant, at donor's request shall execute all such applications, assignments and other documents as may, in donor's judgment, be necessary or expedient for the purpose of obtaining a patent on entrant's solution, or any feature thereof, such patent to be issued in the name of, and to be the sole property of the donor.

8. Popular Mechanics Magazine shall receive no fees or commissions, directly or indirectly, for publishing any offer made through this department, nor for anything it may do in connection therewith. And the publisher is not and shall not be held responsible for the performance of any obligation either of a donor or an entrant. The publisher's responsibility ceases with the publication of the offer.

Entrants may sign and accompany their solution with the following:

To.....
(Here write name of firm to whom your solution is offered.)

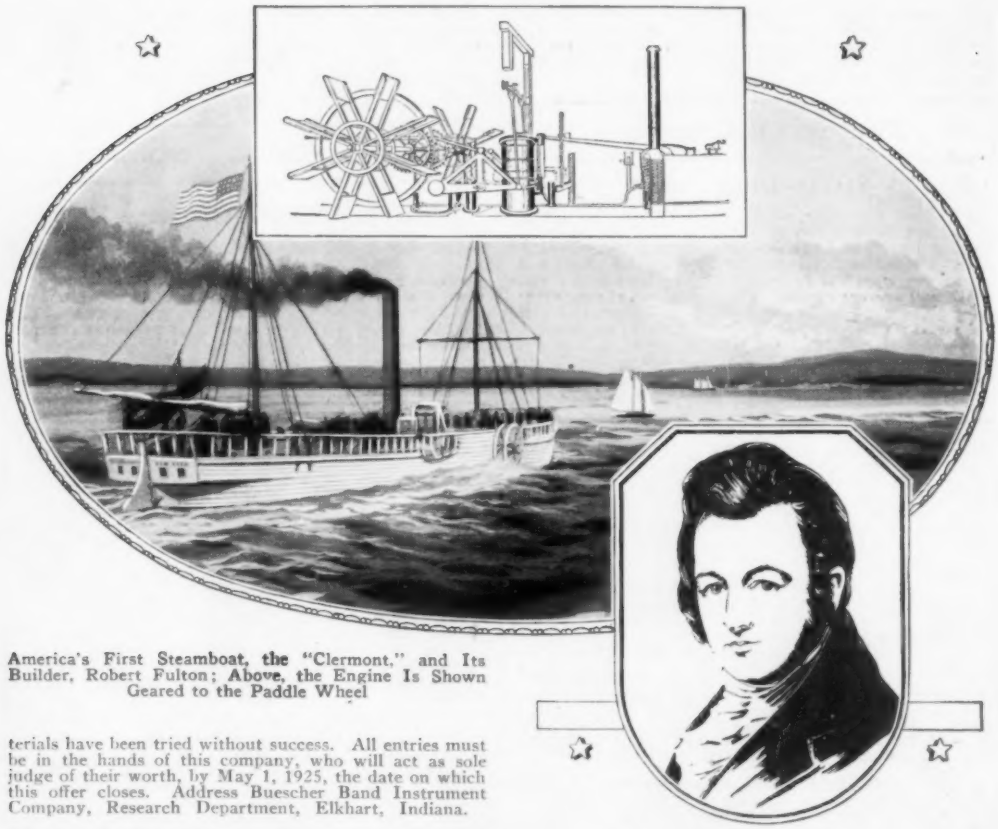
CITY....., STATE.....

Dear Sirs:

Enclosed find my solution of your problem, published in Popular Mechanics Magazine. I hereby submit my solution to you for examination, subject to the terms and conditions published in said magazine, in connection with your offer.

NAME .....

ADDRESS .....



America's First Steamboat, the "Clermont," and Its Builder, Robert Fulton; Above, the Engine Is Shown Geared to the Paddle Wheel

terials have been tried without success. All entries must be in the hands of this company, who will act as sole judge of their worth, by May 1, 1925, the date on which this offer closes. Address Buescher Band Instrument Company, Research Department, Elkhart, Indiana.

Goddard Nurser Company

No. 22—$1,000—Closing Device for Rubber Bottle

Dr. Goddard Nurser Co., Inc., manufactures a collapsible all-rubber nursing bottle for babies. It has been in the market for some time and has proved a success. However, this firm is desirous of procuring an improvement over the present clamp used to close the bottom of the bottle. While our device is satisfactory for its purpose, it is difficult for many lady folks to remove without great effort. We will pay the sum of $1,000 to the person submitting a device that will satisfactorily perform this service and which will be easy to remove and replace without becoming damaged under ordinary usage. Any device or plans submitted must be passed upon by Dr. Goddard Nurser Co., Inc., representatives who alone will decide on the merits of the suggested appliances. Persons interested in working on this clamp are to write us at once for particulars. This offer ends May 1, 1925. Address, Dr. Goddard Nurser Co., Inc., Fort Atkinson, Wis.

Phenix Radio Corporation

No. 23—$1,000—New Variable Condenser

The Phenix Radio Corporation will pay the sum of $1,000 in cash for the design of a new form of variable condenser for radio reception. It must be a departure from the common rotary plate type, the mercury type and the type relying on the decrease of distance between two conducting surfaces for an increase of capacity. The variable condenser must be no larger than the rotary plate type, for a given capacity, and preferably smaller. It must have a gradual straight line curve and have its entire variation through 180 degrees. The new device must not be so complicated in design that the cost of manufacture would exceed that of the present forms of rotary plate condensers. All submitted designs are subject to sole judgment of the Phenix Radio Corporation, who will decide on the value of the device to their organization. May 1, 1925, is the closing date for this offer. Address the Phenix Radio Corporation, 5 Beekman Street, New York, N. Y.

Wodack Electric Tool Corp.

No. 24—$500—Portable Electric Hammer Motion

Wodack Electric Tool Corporation desires a hammer arrangement for an electrically driven portable hammer drill other than a lifting cam and spring. The idea is to secure an electric drill strong enough to drill holes, ¼ to 1 inch in diameter and from ½ to 6 inches deep, in stone or concrete. Such a tool should weigh less than 25 pounds. What we need primarily is a motion that will strike a powerful hammer blow. Our present hammer delivers 2,000 blows a minute, but they are not hard enough. To enlarge the spring of the lifting cam and spring arrangement would call for a larger motor than that used. Perhaps some combination could be introduced to increase the force without such a change. The purpose of the tool must be to drill a 1-inch hole in concrete at the rate of 1½ or 2 inches a minute. For a practical, workable plan or model of a portable hammer drill arrangement that we accept and which proves satisfactory, we will pay the sum of $500. The offer will expire May 1, 1925. Address Wodack Electric Tool Corporation, 23 South Jefferson Street, Chicago, Illinois.

Continental Rubber Works

No. 25—$2,500—Improved Rubber Products

Continental Rubber Works, manufacturers of a nationally known line of automobile accessories, are interested in ideas or suggestions for any new accessories or improvements on existing accessories which are made from rubber, rubber and fabric, or rubberized fabric. Articles to be acceptable must preferably be simple in construction and application, of general appeal and subject to wide use to insure volume sales, and should possess sufficient originality to make them patentable. Continental Rubber Works is to be the sole judge in determining what suggestions are acceptable to this concern, and in the event of the adoption of any suggestion, will enter into a contract to make and sell the article and will pay to the inventor royalties of five per cent of the sales until such time as the royalties amount to a sum ranging up to $2,500, according to the possibilities of the article; whereupon such payments to the inventor shall cease and the article together with all patent rights thereto shall become the sole property of Continental Rubber Works. Our offer expires May 1, 1925. Address Continental Rubber Works, Erie, Pennsylvania.

Problem PD-1

No. 26—$100—Starting Switch for A. C. Motor

This donor will pay the sum of $100 for an accepted design of a starting switch for an alternating-current motor. The switch must operate so as to open the starting winding of split-phase, alternating-current electric motors at a predetermined speed. It must break quickly a current of about fifteen amperes at a speed of approximately 500 r. p. m. The diameter cannot exceed 4⅞ inches by about 1½ inches in length. Operating speed must be adjustable to some extent. Submit drawings and descriptive explanation. Closing date for this offer is May 1, 1925. Address Problem Number PD-1, Popular Mechanics Magazine, Chicago, Illinois.

Many Additional Offers Will Appear in the AUGUST ISSUE

Expert Tasters Hired to Drink Tea to Test Its Purity and Quality

Seated about small revolving tables in the bureau of chemistry of the department of agriculture, several men spend hours daily sipping tea and inhaling fumes from the leaves. They are government testers who compare samples of new shipments with official standards of purity and quality. By their keen sense of taste and smell, they are able to detect adulterations and inferior grades, and before the tea can be distributed to markets from the bonded warehouses, it must have the official approval of this expert jury of tasters, who are appointed by the secretary of agriculture. Laws governing the examination of tea were among the first pure-food regulations passed by the government, and the importance of the inspection has grown with the increasing amount of tea consumed each year in this country, nearly 90,000,000 pounds now being imported annually.

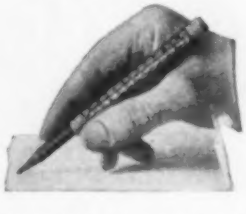
George F. Mitchell, Supervising Examiner, Comparing Samples of Tea with Government Standards of Purity

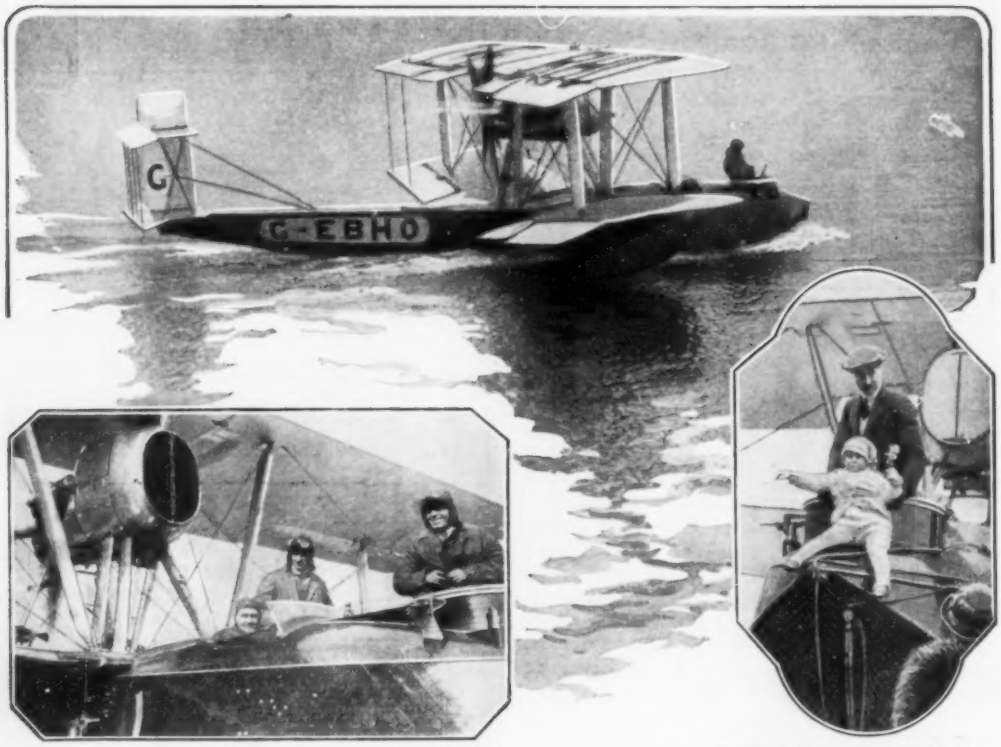
Bird-Egg Jewelry Rivals Amber

Necklaces of wild birds' eggs have been made by an English naturalist-goldsmith. The eggs are paired for size and after being blown are treated by a chemical process and the insides filled with a lightweight composition to give them solidity. As the shells all have different markings, novel effects are produced when the string is completed. The price varies from $20 to $5,000 and more.

Computer That Fits on Pencil Saves Time in Multiplying

Designed so that it can be slipped on an ordinary lead pencil, a handy computer that contains multiplication tables has been devised for the aid of school children and others in figuring. By simply giving the pencil a twist, multipliers and products are shown through a slot in a revolving collar which is numbered from 1 to 12. The calculator is durably made, cannot get out of order, it is claimed, has an eraser in one end and is quickly slipped on another pencil when the old one is used up.





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British Amphibian Round-the-World Seaplane Being "Taxied" to Start of Flight; Left, Crew Going Aboard, and, Right, Commander MacLaren and His Family on Inspection Visit to Flying Ship

Folding Legs on Pocket Flashlight Hold It in Any Position

Usefulness of the pocket flashlight is increased by a holder with spring "legs," to keep it from rolling off rounded surfaces and direct the light in any desired position. The attachment is clamped on quickly and can be slipped along the barrel to hold the light up or down. The springiness of the legs eases the shock of setting the flashlight on solid surfaces, thus protecting the filaments in the bulb. The legs

Flashlight Directed at Desired Angle from Automobile Fender Where It Is Held by "Legs"

fold up with a snap like jackknife blades and do not interfere with carrying the flashlight in the pocket. The attachment is especially convenient in making repairs on automobiles.

British Plane Flying Eastward in Round-World Race

Flying along an eastward course of more than 23,000 miles, the British world-flight crew expects to complete its journey in about ninety-five days. Only one machine manned by three men composes the expedition. Supplies are replenished at each place of call, where previous preparations have been made to furnish the airmen with maps and data regarding the area over which they must pass to the next stop. While much of the traveling is along routes flown before by other aviators, some of the longest divisions of the flight are almost entirely unknown to aerial explorers. Two halts of several days each are necessary to overhaul the ship and replace the engine for severe tasks ahead. A peculiar danger to airplanes passing over some of the islands of the Japan group is that of having the propeller fouled by flocks of slow-moving birds which might be met. The flying boat is of the "amphibian" type and carries a ground landing gear that can be withdrawn above the keel line when the craft is to be set down in water.

Mysteries of Ciphers Keep Corps of Government Experts Busy

Working out the fascinating mysteries of messages in code or cipher keeps a number of federal employes busy. The department of justice, the army and navy, the diplomatic service, in fact, each branch of the government has one or more systems of secret communication which can be used in conducting important official correspondence. In the regular code message a single word or symbol is chosen to represent a group to lessen the cost of transmission. The cipher, however, is always used where secrecy is desired, and is based on two systems. In the first, the letters are transposed according to a carefully planned formula, and in the other, symbols are substituted for every letter in the alphabet. Translating war messages in code or cipher is no easy task, but is simplified somewhat by the fact that they are certain to relate to some movement of the enemy or some phase of war, so that the range of words is bound to be restricted. Experts declare that there is probably no such thing as a code or cipher system that cannot be solved.

Fighting Rooster Fish Is Caught off the Mexican Coast

Rarely caught, and then only after a terrific battle, the rooster fish is described by sportsmen who have encountered it as one of the most beautiful and finest game fish to be found anywhere. Because it roams only in the waters off the west coast of Mexico and South America, it is said to be still unknown to most fishermen. Many expert anglers in the resorts of Lower California have reported the loss of their tackle after a struggle with this fish, so-called because of the grotesque appearance given it by a long fin on the back.

Sportsman Holding Rooster Fish, Claimed to Be Largest Ever Captured with Light Tackle

Latest Game Brought from Orient to Furnish Outdoor Sport

After replacing bridge and chess with Maj Jang, the Orient now comes forward with a new game, this time for out-of-doors. It is called Chin Lou, and is believed to have originated in Burma. It consists in attempting to keep a cane ball in the air by using the feet and knees. As an exercise it is said to have proved very efficient.

Playing Latest Game, Chin Lou, Brought from the Orient to Add to Outdoor Sports

Electric Lights in Head of Banjo Keep "Skin" Dry

Banjo heads may be kept dry and therefore, it is claimed, in good condition by the heat from two small incandescent bulbs placed behind the parchment. They are mounted on the crossbar inside of the instrument and are turned on and off by means of a pull connection on the outside of the rim. Continuous burning will not injure the instrument, it is said. The equipment can be used with 110-volt direct or alternating current.

Fifty Miles on a Gallon of "Gas"?

New Motor-Power Fluid Stops "Knocks" and Increases Power Even with Present Engines

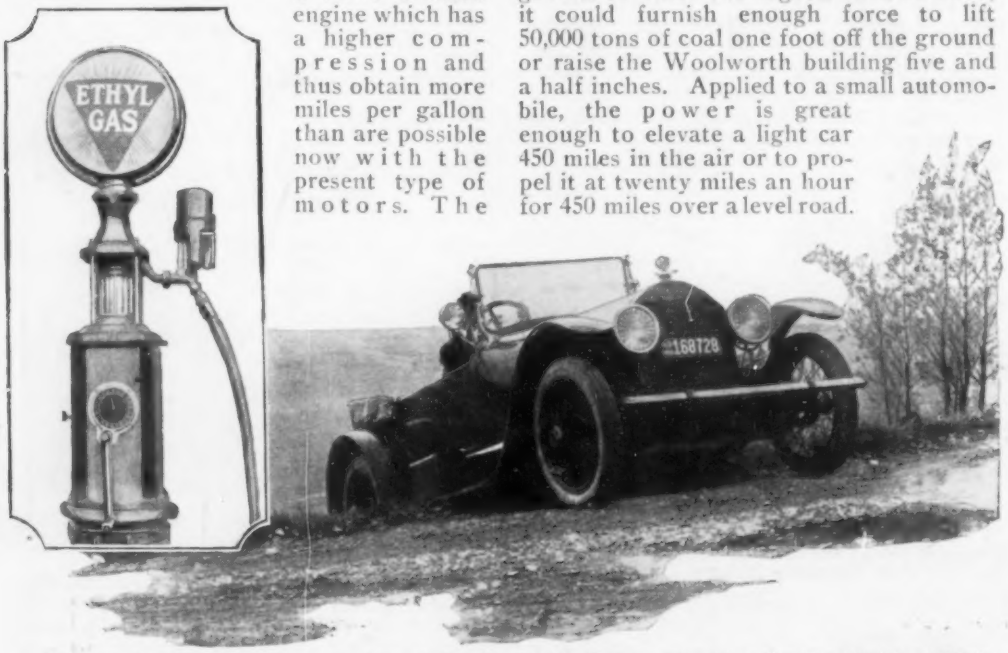
PROMISING a new era in the automobile industry—a time when cars will run from fifty to a hundred miles on a single gallon of gasoline—a fluid known as ethyl is now being supplied to motorists in many parts of the country.

A chemical compound, until recently almost a curiosity costing nearly $600 a pound, it is today obtainable for a few cents an ounce. This amount is sufficient to treat six gallons of gasoline. The immediate result is to change the way the "gas" burns in the cylinders so as to entirely eliminate the "knock."

It prevents the gasoline from detonating and the mixture burns slowly. In other words, the product governs the way the fuel burns in the same manner the governor on a steam engine controls the way the engine runs. It is a combustion governor. The immediate result to the present user is increased mileage, elimination of carbon trouble and the power to go over hills in high, because it is not necessary to retard the spark. But the ultimate idea is to make it possible to put on the market a more efficient engine which has a higher compression and thus obtain more miles per gallon than are possible now with the present type of motors. The new engine must crowd the gas into a smaller space before it is ignited. The thing that now stands in the way of high compression is the knock. Ordinary gas knocks violently in a high-compression engine—so violently that it cuts down the power and even damages the engine. Ethyl gas ultimately will make it possible to use the high-compression motor.

Scientific authorities assert that it is not necessary to add energy to gasoline to get increased mileage. Less than five per cent of its power is now utilized to actually drive a car. The remainder represents effort consumed entirely or wasted through friction. The purpose of ethyl fluid is to conserve part of this waste and put it to work in propelling the car. By reducing the amount of lost power from ninety-five to ninety-two and one-half per cent, mileage may be doubled.

Were all the energy of one gallon of gasoline to be harnessed for the performance of a single purpose, experiments show that it could be made to provide sufficient heat to raise the temperature of 15,000 gallons of water one degree. Put to work, it could furnish enough force to lift 50,000 tons of coal one foot off the ground or raise the Woolworth building five and a half inches. Applied to a small automobile, the power is great enough to elevate a light car 450 miles in the air or to propel it at twenty miles an hour for 450 miles over a level road.



Ethylizer Attachment on Discharge Line of Gasoline-Station Pump, and a Test Car Propelled by "Ethyl-Gassed" Fuel, Taking a Hard Hill in High

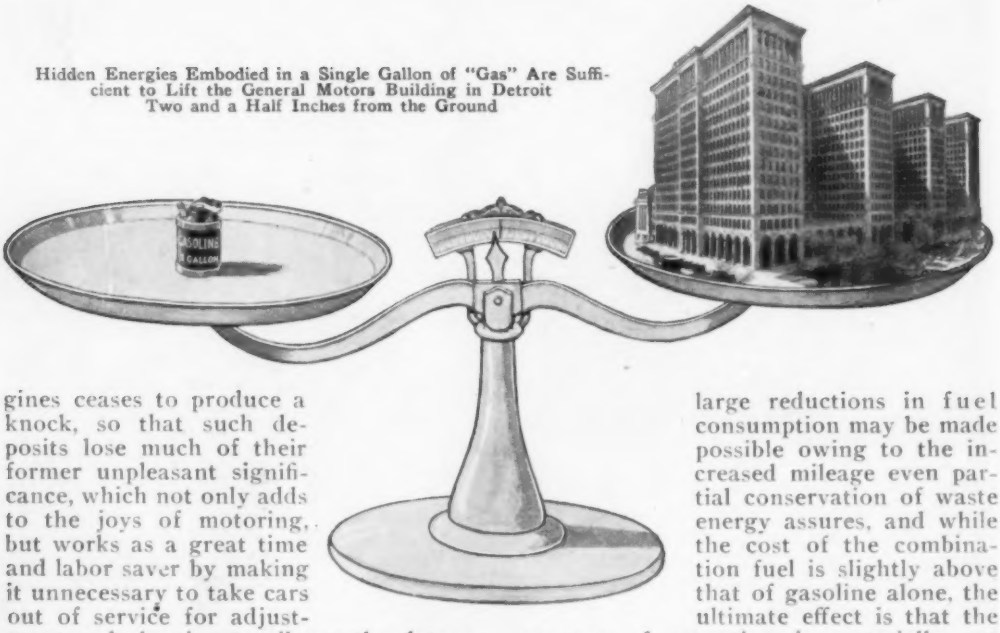
Ethyl gas assists in keeping a larger portion of this tremendous power at work. C. F. Kettering, president of General Motors Research corporation and one of the world's leading engineers, has shown that with a simple application of the ethyl lead to the present fuel, it is either possible to derive twice the power from present engines through raising the compression, or to build high-compression engines of half their size, which could deliver the same amount of power as produced by ordinary types in use today.

Therein lies what has been called the tremendous significance of the chemical, the greater part of which is composed of alcohol and lead. It is to be sold already mixed with the gasoline by filling stations of the Standard Oil company and similar dispensers of fuel. And to expedite its combination with the liquid, the gasoline measuring pumps at the supply stations are equipped with a contrivance which feeds the ethyl fluid directly into the discharge line, permitting it to thoroughly mix with the gas passing into the tank of a car. Resembling a water-gauge glass on a steam boiler, the attachment has a small crank, each turn of which determines a sufficient supply for six gallons of gasoline.

Within a few moments and at the same time as the motorist gets his supply of fuel, his car is saved from the wearing process of the damaging knock during its operation with the prepared fluid. With ethyl gas even the carbon present in en-

Imaginary Illustration of the Latent Forces Pent Up in a Single Gallon of Gasoline; Were It Possible to Apply All of This Power to an Armored Automobile, the Car Could Be Sent Rocketing through a Structure of the Type of the Woolworth Building

Hidden Energies Embodied in a Single Gallon of "Gas" Are Sufficient to Lift the General Motors Building in Detroit Two and a Half Inches from the Ground

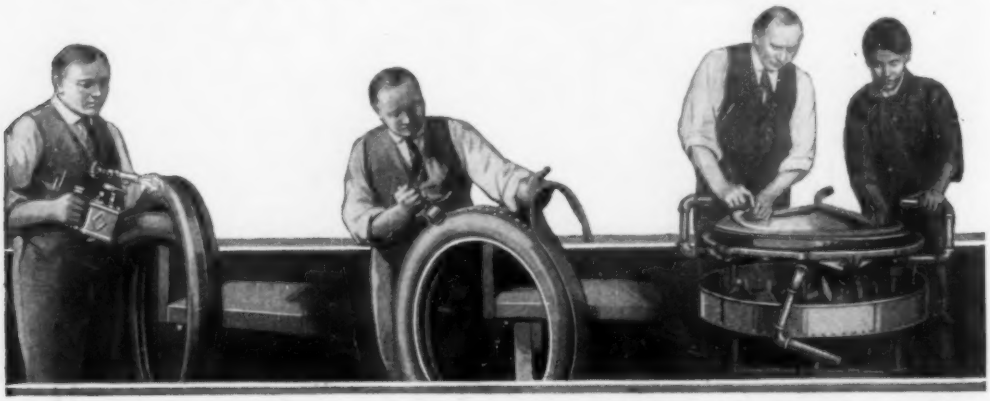


gines ceases to produce a knock, so that such deposits lose much of their former unpleasant significance, which not only adds to the joys of motoring, but works as a great time and labor saver by making it unnecessary to take cars out of service for adjustment and cleaning to silence the detonations. In addition to these improvements, large reductions in fuel consumption may be made possible owing to the increased mileage even partial conservation of waste energy assures, and while the cost of the combination fuel is slightly above that of gasoline alone, the ultimate effect is that the expense of operation is materially cut down, it is said.

Fusing Old and New Rubber to Aid in Reducing Tire Costs

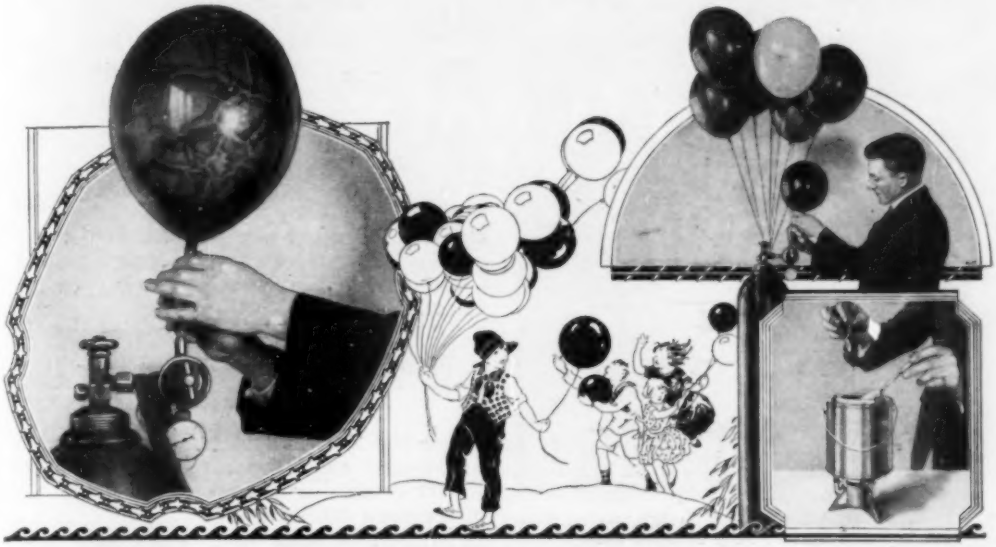
By fusing new and old rubber under a recently invented process, automobile tires may be repaired quickly and economically without the use of vulcanizing cement and without stripping or buffing them, it is claimed. The method leaves all the old rubber on the tire as well as the cord. In place of cement, non-explosive and non-inflammable compounds are applied to the surface and a strip of new rubber put on. When heat is applied, it is said to fuse the new tread with the old, joining them into one solid piece. To assist the curing process, the inventor has devised a mold for retreading and repairing which is designed to hold balloon tires or three ordinary tires of various sizes. The method is said to prevent blisters, loose treads and side cracking.

¶Indians in Venezuela are reported to have discovered a substitute for coffee in the bean of a weed that grows in abundance there. It is said to have all the characteristics of coffee except caffein.



Heating Compound after Application to Tire, Binding Together Broken Tread and Placing Tire in Mold for Curing, Are Three Important Steps in Repair Process without Vulcanizing

TOY BALLOON'S LIFE PROLONGED BY COATING



Inflating Toy Balloons from Hydrogen Tank after Coating Them with Gummy Preparation; Inset of Dipping Process at Right Shows How Can of Mixture Fits Tiny Stove

Life of toy balloons is prolonged from a few short hours to several days by coating them with a gummy preparation. Just before they are filled, they are dipped into the substance which has been melted to the consistency of sirup in a small portable heater. The liquid dries in a few moments and so effectively seals the pores of the inflated rubber that the balloon remains buoyant and keeps its original gloss from three to seven days. The preparation contains no harmful ingredients.

Inlaid Table Finished by Carver after Twelve Years' Work

After twelve years of work, a noted Italian carver has completed a remarkable table. The top is four feet square and is inlaid with woods of various colors representing human figures. With the bridging of mirrors, it is about eight feet high. Every piece of wood used in its construction was cut and trimmed by hand, the result being a masterpiece of art.

Table Carved of Different-Colored Woods which Are Inlaid to Represent Human Figures

Liner's Safety Chains Are Forged by Thousand-Ton Hammer

Taking the place of the village smithy, huge hydraulic hammers, equal in weight to one of thousands of tons, now forge the anchor chains that guard the lives of the thousands of passengers on the modern liner. The chains for the Lusitania were nearly 2,000 feet long and weighed 125 tons. Every link has to be carefully welded at the proper temperature and many inspections are required.

Votes Recorded Directly by Machine without the Use of Ballots

Time in counting and casting election votes is said to be saved in an accurate voting machine devised by a Los Angeles

Demonstrating Mechanism of Ballot Machine to Two Prospective Voters; Tally Sheet on Back

inventor. Votes are registered directly upon a tally sheet within a small cabinet which can be carried like a suitcase. Totals are automatically added and "juggling" figures is said to be impossible.

Three-Wheel Roller Skates Fast and Light in Weight

With only three wheels instead of the usual four, a roller skate which weighs but fifteen ounces, has been invented in England. The wheels are in alinement and the center one is slightly larger than the

Inventor with His Improved Three-Wheeled Cushion Roller Skates; Note Larger Center Wheel

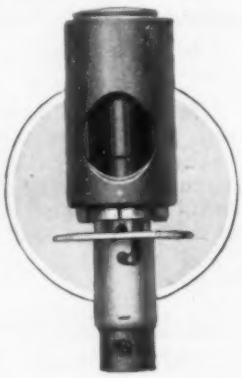
others. Greater speed and comfort are said to be achieved in this style. They are bolted to the shoes like ice skates and are said to be noiseless.

Spider Webs Serve as Trimming for Women's Hats

Spider webs are reported to have been prepared successfully by a European collector for trimmings for women's hats, handbags, cushions and other articles. The webs are first transferred to gummed cards and then treated with chemicals to give them strength and to make them waterproof. They are then placed on the cloth background like silken threads. As a full-grown spider can spin a new web in about an hour, a constant supply of the material is easily obtained.

Wireless Auto Cigar Lighter Is Heated by Electricity

For the convenience of the autoist, a simple and easily operated electric cigar lighter consisting of two carbon points set in an open holder connected to the lighting system has been patented. Contact is secured by pressing the top point against the one in the base by a push button. In a few seconds, the points become red hot when the holder is lifted from its socket and used to light the cigar or cigarette. There are no wires attached to the removable part, as the carbon retains the heat long enough to ignite the tobacco.



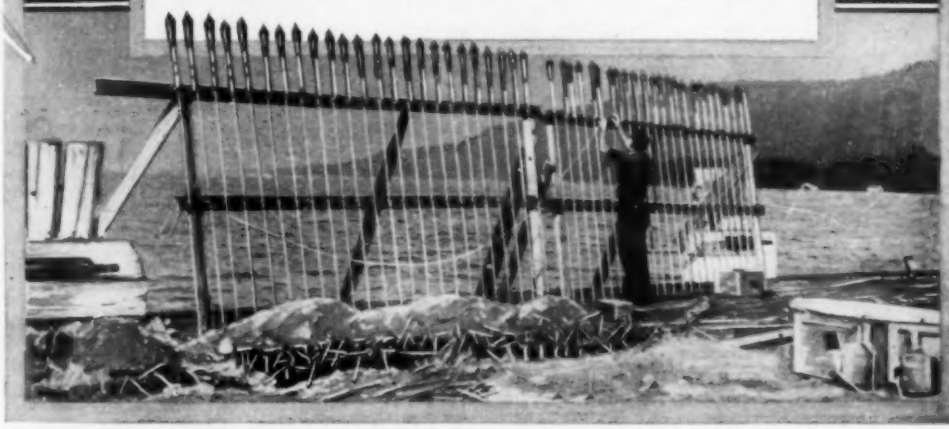
Floating Factories for Whalers

Like eager prospectors in quest of gold, the whaling fleets flocked to the South Atlantic when the ocean around the Falkland Islands was reported to be "alive" with whales. The fisheries there are now said to be more profitable than all other whaling grounds in the world put together. To save the boats trips to port with their catch, floating factories have been established to treat the blubber at sea. Often the rest of the whale is thrown away for lack of facilities to care for it. During one year, a score of whaling boats operating from South Georgia was reported to have killed 5,000 whales from which 200,000 barrels of oil valued at more than $2,000,000 were obtained.

Painting the Sky with Powder

PAINTING monster pictures across the heavens with gunpowder has been developed into an art in the United States. It was only forty years ago that American inventors began dabbling in fireworks. Previous to that time, and outside of the conventional Fourth of July firecrackers and skyrockets, pyrotechnic displays were confined almost exclusively to the birthplace of the industry—China.

Today, one and a half to two tons of gunpowder are set off nightly at thousands of state and county fairs solely for the entertainment of immense crowds of spectators. This fondness for mammoth fireworks spectacles has developed more generally since inventors applied mechanics to produce realistic and full-sized gunpowder pictures in the sky. While the celebration of Independence Day was once the sole one-day-a-year outlet for the products of skilled pyrotechnians the country over, so popular have the displays become that thousands of dollars are spent by summer parks and resorts for nightly shows that fill the sky with radiant glows and gorgeous streaks of color, to amuse their patrons as well as to advertise themselves. Acres of open spaces are utilized each year by fireworks "stages," and there is hardly a battle



scene or great disaster that the artist cannot imitate. Familiar figures from nursery rhymes and songs are easily adapted to the set pieces by the gunpowder artist. A robust Santa Claus, riding in his sleigh behind a team of galloping reindeer can be clearly drawn in fire outlined against the night. Fairy characters, such as Little Bopeep and her sheep, can be made to loom up suddenly in a vivid glow from a far corner of the field, to surprise the spectators, while well-known cartoon characters can be reproduced easily in sputtering ropes of fire by pyrotechnians, who often present them in weird effects. Spectacles of great size, representing earthquakes, large conflagrations and naval battles require months of time and hundreds of skilled men to build. But in ten minutes after the first fuse is lighted, the entire structures go up in smoke and flame leaving only blackened framework as evidence of their existence.

Courtesy, Thearle-Duffield Fireworks Company

Artists Painting the Setting for a Fireworks Spectacle That Depicts a Burning City Enveloped by Flames and Pillars of Lurid Smoke

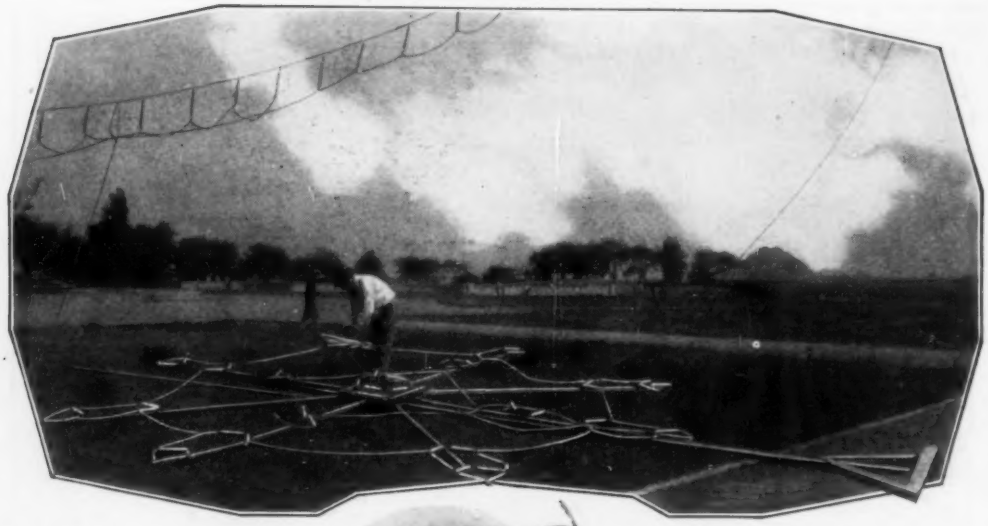
Most of the fireworks used in America and Canada are made in a few large plants which, in some instances, cover acres of ground and employ several hundreds of craftsmen who design and build the sets during seven months of the year. The remainder of the time, these workmen travel from place to place where the displays are to be shown and take charge of the performances.

All displays, great and small, are built on practically the same principles. Before the actual work on a spectacular piece is started, however, the designer visits the scene or subject he wishes to portray. First-hand knowledge is always sought, and it is not an uncommon thing for these men to journey thousands of miles to view some world event or the scene of a great catastrophe. Accuracy, despite the leeway pyrotechny permits, is of prime importance to these artists in fire. Following the personal study of the original of the design, a carefully made model is built to a small scale. From this copy the larger set is planned. The spectacular pieces are constructed on light wood frames, twenty feet square, subdivided into one-foot sections. The sizes of the spectacles are determined by mounting these skeletons one on another until the desired proportions are secured. Forming of figures to show in fire outline, is accomplished by tracing the shapes over the framework in rattan wrapped with a casing of gunpowder. Thicknesses of this inflammable tape vary with the intensities required. Usually it is made about as thick as an ordinary lead pencil. Rattan, being pliable, does not break easily and may be bent over the supports with little effort on the part of the workman.

Approximately every four inches along the gunpowder rope, incisions are made and color pieces inserted in the openings. Red, white, blue, green and yellow are the only shades that can be produced in fireworks. Steel filings give the golden-spray effect when the piece is burning, while powdered aluminum takes on a brilliant white light. It is in placing the colors that the artistic touch of the pyrotechnian is displayed. This part of the work seldom can be taught the craftsman, and even after many years of study, some men utterly fail to achieve the results they seek in combining the hues.

Before the application of mechanics to fireworks, powder fuses were relied on to carry the flame to every part of a design, but now the pyrotechnian weaves the entire set with fine electric wires. These are broken about every three inches so they will cause a spark when charged with current. Until this method was employed, success of the displays was generally ruined if the parting of the rattan happened to sever

Display of Aerial Bombs and Rockets Bursting above Realistic Background While Batteries of Searchlights Throw Beams of Many Colors on Clouds of Vapor and Smoke



the fuse line. Now, by the use of electric wiring, such accidents do not endanger the complete ignition of the piece, for when a switch is thrown in, a hundred or more tiny arcs occur at as many points along the tracing of the spectacle. While the building of the design for a great reproduction is going on, costumes for actors and fireproof scenery that may be required to carry out the suggestion of realism, are being worked up. With the larger spectacles, 200 to 500 persons in appropriate regalia are often employed to represent populaces or fleeing refugees, and work under the guidance of a director stationed at a loud-speaker apparatus. Steel mortars that cast up the deafening aerial bombs in

Attaching Fireworks to Giant Pinwheel Which Is Then Hoisted into Position with a Block and Tackle, and Two Aerial Shell Charges to Be Shot into the Air from Steel Mortars Shown Below

their five to six-hundred-foot flights, range from nine to twenty-four inches in diameter. Shells which carry several charges to explode in the air at intervals have an arrangement of many fuses that control the bursts. As each one performs its work, it ignites another until they are all consumed. A set of scenery for a large production, such as the destruction of a great city, requires about four railway cars for its transportation. When in place, it covers an expanse of three acres and, seen in daylight, might resemble a miniature city. The fireworks are set up about six feet in front of this background. A replica of Niagara Falls, seventy-five feet long, burns for only one minute and consumes approximately one ton of finely powdered aluminum.

Houses in Trees Save Cost of Land for Filipino Dweller

Although the Filipino builder of today usually erects his house firmly on the ground, many of the natives of the islands still persist in making their homes high in trees. What is said to be the highest house in Guadalupe town is forty-seven feet from the ground. The structure is valued at about fifty dollars and can be easily replaced if destroyed by one of the earthquakes which periodically shake the islands.

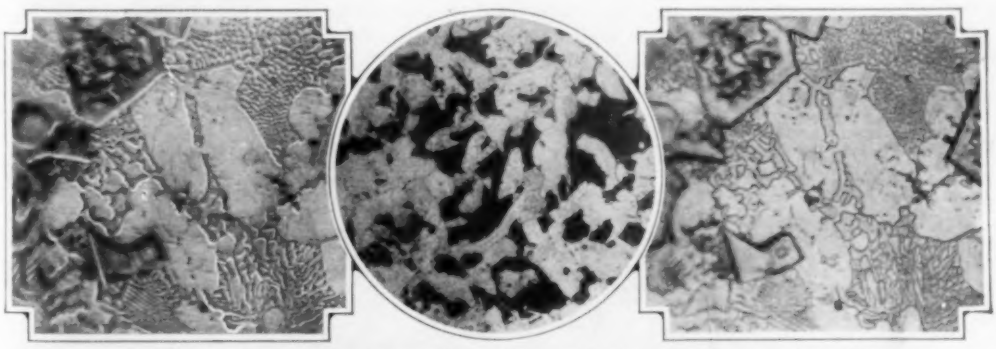
Filipino House, the "Highest" in Guadalupe Town

Field Mice War on Bees

Nesting in straw packed about cases that contain beehives, field mice are reported to have caused much damage to honeycombs last winter in Wyoming. For protection from the intense cold, the houses of the insect colonies are placed in large boxes well padded with hay and straw in which the tiny rodents also make their winter homes. It is proposed to place a small can of poison at the opening of each hive as a protection.

CRYSTAL HILLS AND VALES REVEALED IN STEEL

Crystal formations of steel and practically all other metals are being brought out for study under the microscope by light cast against them at an angle. Until recently, such examination has been possible only by direct illumination—that is, the light is thrown down vertically on the specimen revealing the crystal shapes, which are much like snow or ice forming from water or vapor, in the same way that a person would look down vertically on a carpet or landscape, thus seeing the general lay of the pattern or scenery but no depressions or elevations. The latest method of lighting by which the rays are thrown on the specimen obliquely, or at an angle, instead of vertically, is known as conical illumination. This reveals the beauties of the crystal formations, depressions and elevations in the surface of the steel which have heretofore been invisible, and even makes possible the detection of the boundaries of crystals or grains. To the scientist this is of importance and new knowledge of the structure and constitution of metals is expected to result.



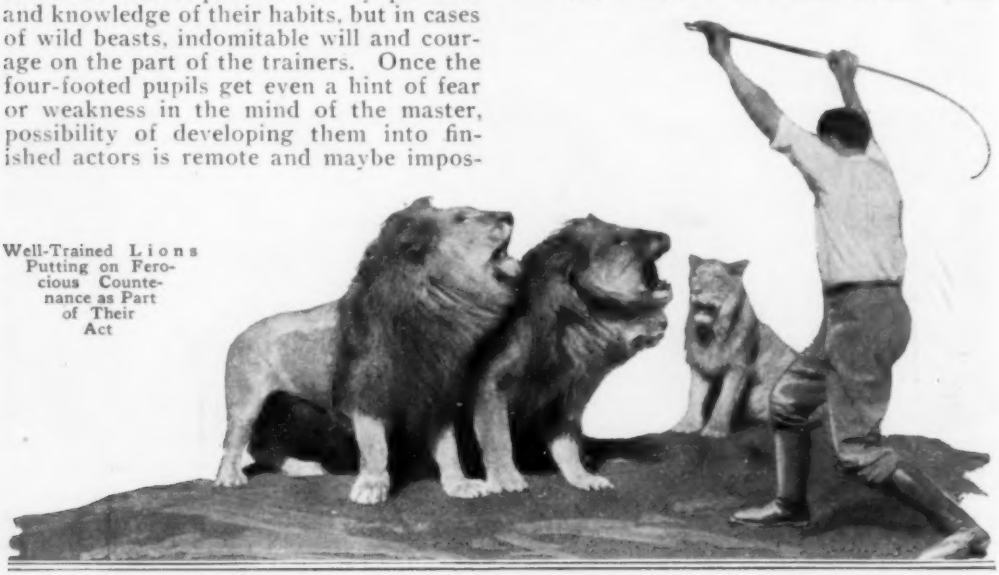
Under Conical Illumination, Shadows of Tiny Hills and Depressions in Steel Are Revealed by Microscope as Shown at Left and Right; Center: Magnified Photograph by Vertical Light

How Animals Into Stars

SNARLING and biting, leaping about in the midst of a pack of healthy-looking wolves that seemed to threaten his life and that of his fallen master, a big German police dog, staging a fight in deep snowdrifts, suddenly withdrew at a critical part of the combat and retired, ears alert and tail wagging in apparent pleasure, while his enemies scampered to a safe distance and watched him. It was the end of a scene for the movies in which the dog and his opponents were rated as skilled animal "actors."

Making motion-picture stars of animals is a task that requires not only patience and knowledge of their habits, but in cases of wild beasts, indomitable will and courage on the part of the trainers. Once the four-footed pupils get even a hint of fear or weakness in the mind of the master, possibility of developing them into finished actors is remote and maybe impossible. It is only by unwavering insistence and constant watchfulness that the trainer can suppress the brute instinct to strike back in retaliation for the prod or push that sets the untamed animal up for a pose. Then, too, the animals are not to be persecuted or teased by annoying implements of the work. Such treatment causes "grudges" which might end in fatalities. Where dogs, horses and other domestic animals are being taught the fine points of screen acting, the natural fear of man which wild beasts hold, is absent and much hard work made unnecessary. Putting them through daily paces of jumping fences, untying ropes with their teeth and carrying objects to designated places gradually aids in educating the friendly sort to an understanding of what is wanted of them. It is not long, then, until they reach a stage of learning where they can take parts together with human actors or carry out difficult duties in performances with other animal players.

No matter how ferocious the wild animal might be in its natural haunts, it seems to forget much of its bad humor after



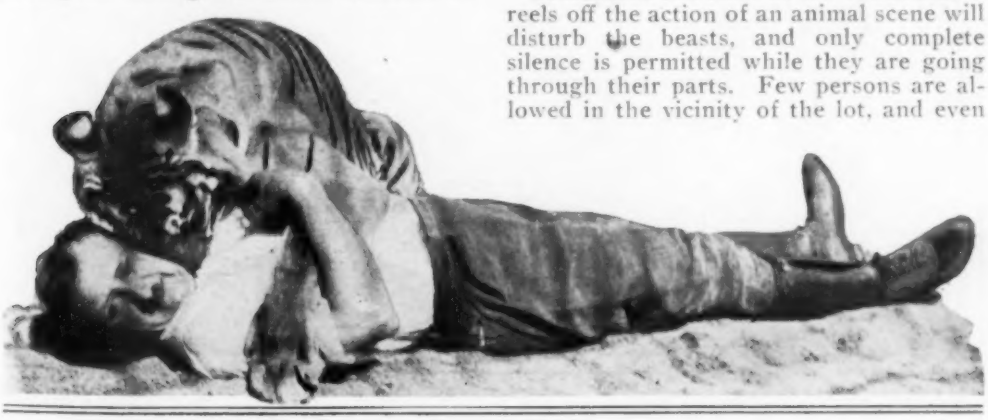
Well-Trained Lions Putting on Ferocious Countenance as Part of Their Act

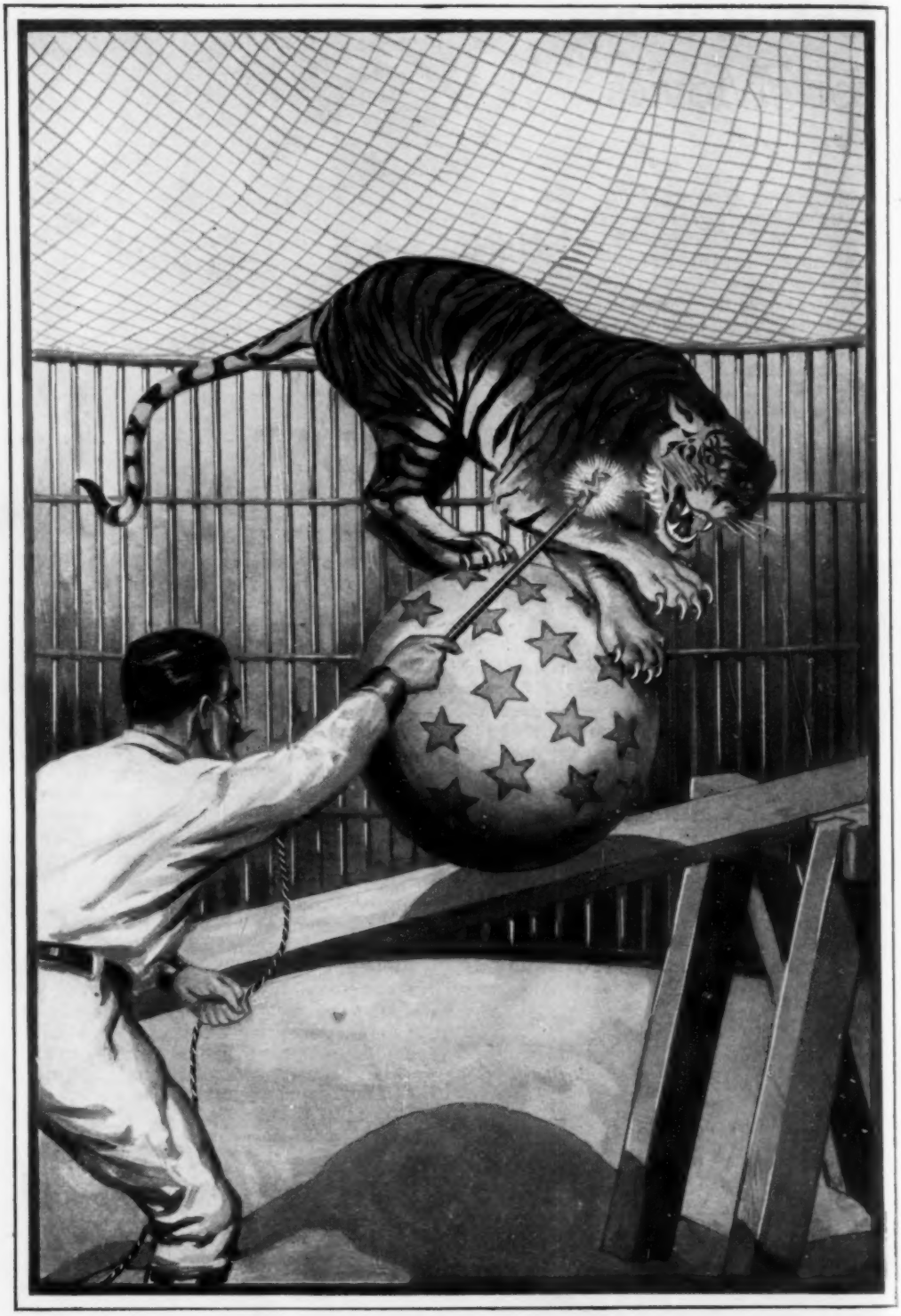
Are Turned For Movies

undergoing a period of preparation at the hands of trainers of the silent drama. Occasionally, in a moment of resentment, one of the animal actors, goaded to madness by the torment of rehearsals, may leap at its "teacher," but watchfulness on the part of the trainers and assistants generally avoids any serious injuries to them. To the experienced worker with jungle beasts, such as lions, tigers and the treacherous leopards, moods of the animals quickly warn of impending danger, giving ample time for withdrawal. However, agility and alertness quite often are unavailing, with the result that many trainers pay with their lives for their efforts to "star" some magnificent specimen of jungle "cat."

The tendency of horses, dogs and other of the more familiar animals to seek the companionship of man reduces their preparation for the movies to a matter of mere education, through the winning of their affection by the trainers, coupled with patient coaxing and small rewards of dainty morsels of food, or caressing, which are all thoroughly appreciated by the "scholars," who show aptitude and willingness to work well in return. Indeed, even the ponderous elephants take easily to this sort of treatment, and many instances are on record where herds of them, to which circus tricks have been taught, have gone through an entire schedule of stunts in the corral with no attendants about, long after they were put up for the night. While cruelty is now almost entirely abandoned by wild-beast "breakers," it is necessary at times to resort to painful punishment in order to teach obedience to the will of the man charged with developing good animal actors. But seldom is anything more than the electric whip or a tough lash used to subdue obstinate or rebellious "cats." More often, kind and gentle treatment produces quicker and more lasting results. The youngest specimens, unaffected by freedom of action in the open, are generally selected. As they grow older and lose their tendency to be kittenish, they bear more watching, for age seems to make even those born in captivity resentful of man's presence.

Sometimes the click of the camera as it reels off the action of an animal scene will disturb the beasts, and only complete silence is permitted while they are going through their parts. Few persons are allowed in the vicinity of the lot, and even





Rebellious "Cat" Actors Require Courage and Will Power from Trainers Who Force Obedience with Aid of Electric Rods That Sting the Beasts into a State of "Gentleness"

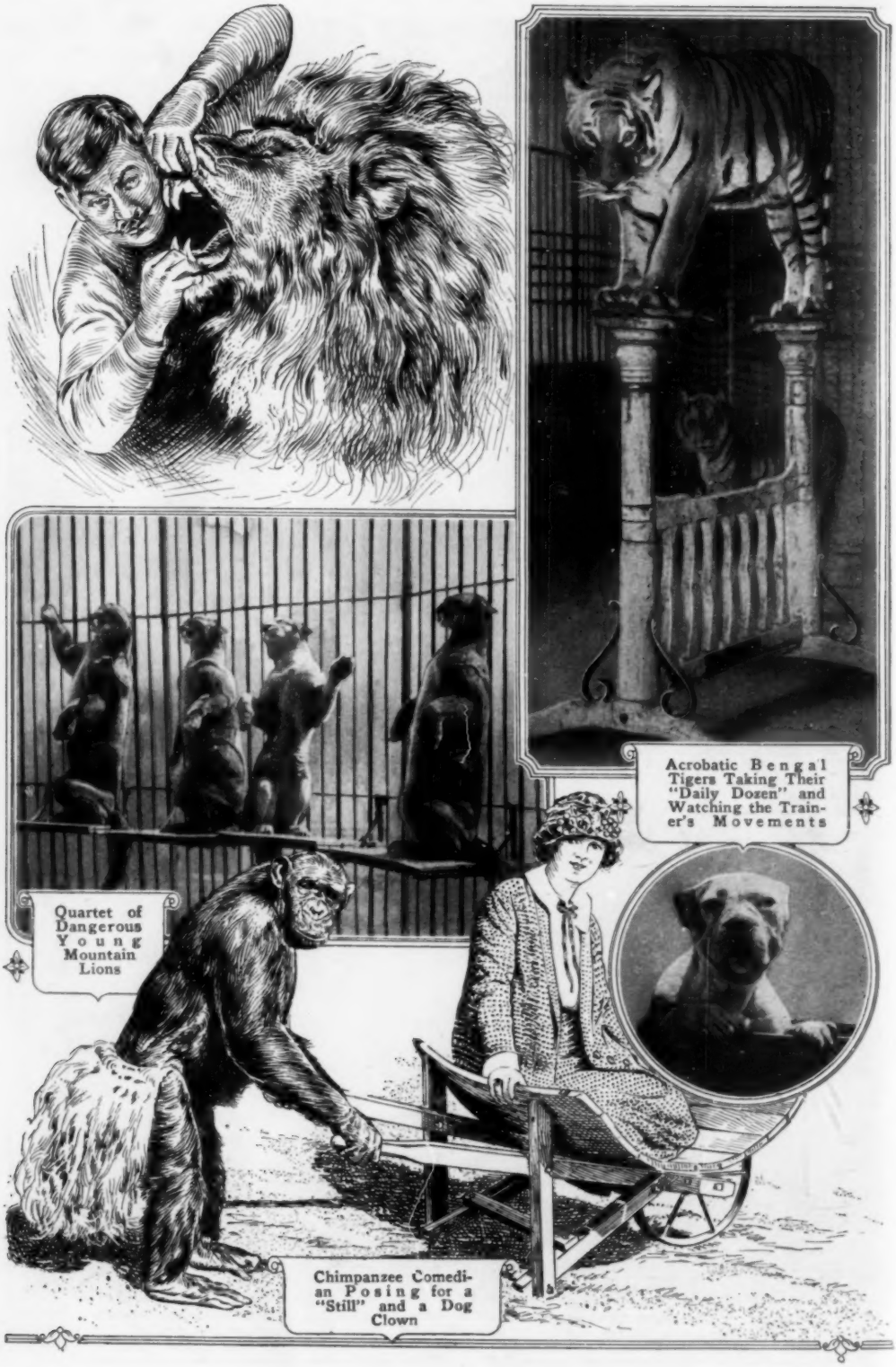
In Learning the Ways of Man This Chimpanzee Movie Star "Took Up" Smoking and Shares a "Light" with Its Director

Brushing the Coat of a Cheetah, a Daily Task That Delights the "Cat"; Only the Keeper Can Render This Service

Dog Actor Taking Its Exercise Which Keeps It in Good Trim for Many Difficult Feats That Are Part of a Canine Movie Star's Work

Bengal Tiger Wrestling with Its Trainer; a Cage Gate Is Open for His Escape in Emergency

Rehearsing a Dog Principal for a Climbing Part in a Screen Thriller That Features the Animal



Acrobatic Bengal Tigers Taking Their "Daily Dozen" and Watching the Trainer's Movements

Quartet of Dangerous Young Mountain Lions

Chimpanzee Comedian Posing for a "Still" and a Dog Clown

a whisper is forbidden, for fear it might interrupt and ruin the entire performance. Once disturbed, only return to quarters and restful solitude will help the wild varieties to forget the incident and prepare them for a later trial.

Wolf "Actors" Seem to Take Willingly to the Training That Fits the "Pack" for Villainous Parts in Movie Thrillers of the North

To the audience witnessing a reproduction of such scenes on the motion-picture screen, every move seems to work out smoothly and naturally, without any appearance of precaution on behalf of the cameramen and players. A hunting scene in thick tangles of jungle looks as though it had been gone through on the usual type of location. What cannot be seen is the armored protection that surrounds the machine operator or the invisible iron bars that, hidden by trees and brush, inclose the entire ground over which the action takes place. Many of the animal movie stars, of course, are quite tame and not only submit to being handled but welcome a friendly pat or a softly spoken word from those about the studios. At any time, nevertheless, their humors may be such that trainers with whom they are hourly associated may have difficulty in getting a show of response, other than a growl or snarl, though armed with tempting bits of raw meat. And yet, many a valuable captive jungle cat has been said actually to die of a broken heart when separated from its attendants. The apes and monkeys particularly are claimed to show this character of affection and dependence on attention and companionship. To offset such possibilities of lonesomeness and to keep the captives from becoming restive, pups and kittens are frequently placed in the cages with some of the bigger beasts.

How Four Small Lion Cubs Were Used to Add a Spectacular Touch to a Dancing Ballet Appearing in an Elaborate Setting for a Motion-Picture Production

Garden Rake and Hoe Are Combined to Assist in Weeding

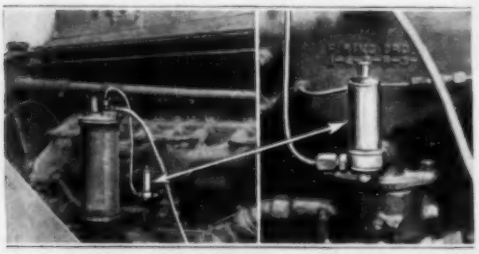
For use in small gardens, a tool has been made that is equally well suited for hoeing and raking. A double-edged steel rocker

Rake Teeth on One Side and Hoe on Other Double Garden Implement's Usefulness

blade destroys weeds and loosens the soil, while teeth on top of the weeder furnish the rake. A larger implement with teeth of malleable iron is made for weeding rows up to fourteen inches wide.

Air Valve on Auto Motor Saves Gas and Reduces Carbon

Working on the principle of the Bunsen burner, which uses more air and less gas, a ball-valve device, which is easily at-



Automobile Air Valve Which Automatically Checks Flow of Gasoline According to Road Grades

tached to any gas engine, has been invented to stop waste of gasoline, improve combustion, reduce fuel bills, make starting easy, and to increase speed and power. It is entirely automatic in operation, the valve being closed until the suction of the running motor opens it, when air enters and reduces the flow of gas through the carburetor. Thus a "fat" mixture is used for starting, which then is automatically made "lean," thereby checking the formation of carbon and saving fuel. The device is noiseless in operation, and needs no attention except cleaning. It may also be used to prime the engine in starting, or to introduce carbon remover into the combustion chambers.

Cigar That Won't Break in Pocket Has Stem-Fiber Wrapper

After a year of effort, two eastern professors are said to have discovered a method of treating cigars so that they will not break in the pocket. The leaf stems of the tobacco, which have long been regarded as refuse, are utilized in the process. Mixed with a juice pressed from whole tobacco leaves, the stems are then rolled flat in a paper pulp machine. The result is a tough, paperlike material which makes a sturdy binder. The wrapper is treated with chemicals to overcome all objection to its odor.

Plug Puller Guards Lineman from Shock and Injuries

For the protection of linemen in taking out the plugs from transformer fuse blocks, an insulated clamp puller has been devised. It has two prongs, covered with rubber and shaped to fit over the knob of the ordinary plug cut-out. A lock lever with a spring, holds them securely against the knob. Additional protection from a flash or an arc is provided in a bell-shaped insulator below the hook and in the stick which keeps the lineman's hand a safe distance from the current.

¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

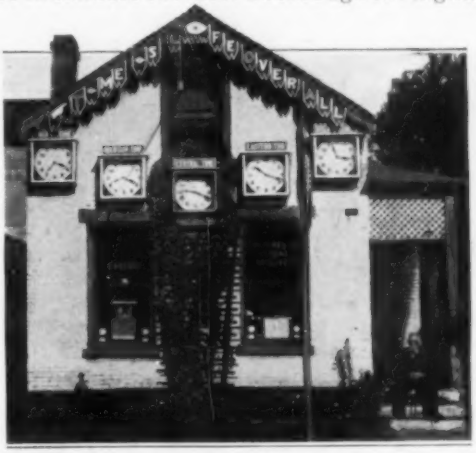
Playing Maj Jang on the Deck of a Sampan in Shanghai's Crowded Docks; These Chinese Coolies Rival in Skill the Best American and European Players

Ragged Coolie Maj Jang Players Rival Europeans in Skill

Originated nearly 3,000 years ago by a Chinese fisherman, the game, commonly known in the United States as Maj Jang, is still popular among the natives at Shanghai and other Chinese ports. One of the most common sights along the waterfronts is that of an earnest group of coolies intently bending over a "wall" of tiles on the prow of a sampan. Almost any of these ragged natives, it is said, rival in skill the best European and American players of the game.

Exact Time in All Parts of U. S. Told by House of Clocks

To aid travelers and motor tourists, five clocks, each indicating time for a different part of the United States, have been placed by a watchmaker on the front of his establishment in Hannibal, Mo. In addition to serving the passers-by, the arrangement acts as an advertisement for the shop. Every day correct time is received by telegraph and by radio from Washington so the instruments can be kept properly adjusted. The cases for the timepieces were made by the craftsman from dry goods boxes, and the hands and dials were fashioned from scrapped sheet metal and painted. The works were all assembled by the watch mender from parts of other clocks, and electric lights were installed to illuminate the faces all through the night.



House of Clocks where Timepieces Show the Hour for Any Part of United States

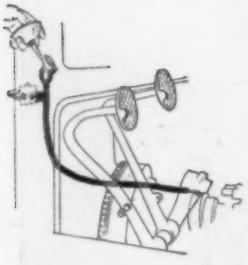
Pastry Chef Molds Sugar Windmill and Candy Rose Jar

Molded entirely from sugar and colored candy, a windmill and a rose jar built by a pastry chef of a San Francisco hotel

Pastry "Artist" with Realistic Windmill Which He Molded from Sugar and Colored Candy

rival the work of skilled artists. The mill, which is a miniature of the old Dutch type, is constructed on a light wire frame in realistic imitation of rustic architecture. The flowers droop lifelike from a vase beautifully designed in confection and are finished in their natural shades. Even the stems were made from green-hued sugar.

Clutch-Collar Oiler on Automobile Is Easily Reached



Difficulty in lubricating the clutch collar on some automobiles is eliminated by a flexible metal tube connecting the collar to an oil cup with hinged cover placed in a convenient position under the engine hood. The tube is locked securely to the collar by a special connection. It can be installed without drilling holes.

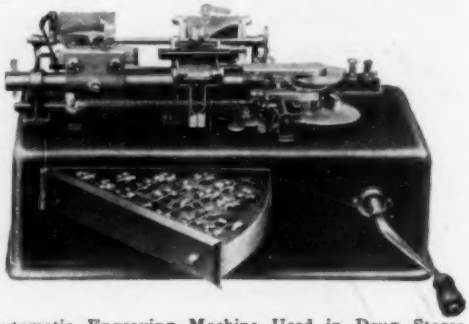
¶Eagles, larks and crows have been known to fly at a height of 6,000 feet.

Pocket Gopher as Nature's "Plow" Enriches Soil for Farming

Cursed by farmers for its destruction of grain, alfalfa and other crops and for the havoc it plays in irrigated lands, the pocket gopher should not be condemned entirely, according to Dr. Joseph Grinnell, director of the museum of vertebrate zoology at the University of California. This little animal for centuries has been cultivating the ground by its burrowing, bringing up fresh soil, exposing it to air and moisture and functioning in much the same way that a plow does in the hands of a skillful plowman. Vegetation carried underground by the gophers has also enriched the soil. Tests made by Dr. Grinnell and his associates showed that in one year, the gophers in Yosemite national park brought up in their burrows at least 8,000 tons of earth. This process, repeated year after year in lands once uncultivated, is believed to have done much to prepare the soil for fruitful harvests.

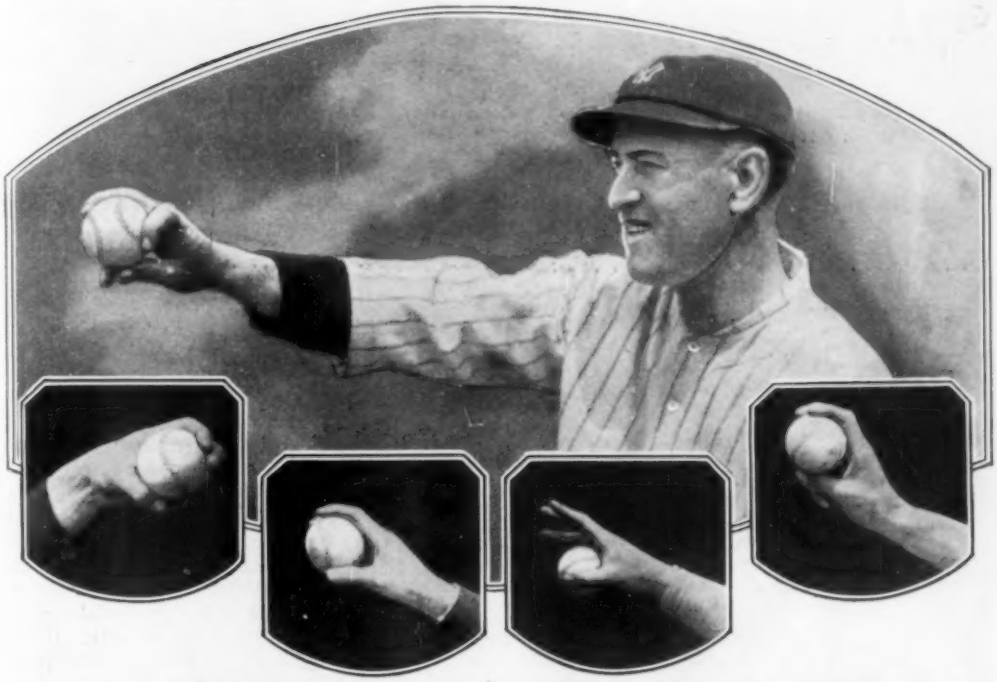
Automatic Engraving Machine Does Work of Skilled Fingers

Engraving, the art of which dates back nearly 4,000 years, is now being done by an automatic machine. With it, a 10-year-old boy is said to be able to place initials, lettering and designs on hard or soft materials in a fraction of the time required by a skilled worker under the old



Automatic Engraving Machine Used in Drug Stores and for Lettering Jewelry

method. The device was constructed especially for use in jewelry and drug stores for lettering pens, cigarette holders, pocketknives and such things. After dies have been adjusted properly and the article inserted, the machine automatically puts on the letters. It is operated by a spring or electric motor, weighs only sixty pounds, can engrave a pen or pencil in three minutes and cannot make mistakes.



Pitchers' Grips That Baffle Baseball Batters and Used by Big League "Twirlers"; the Fork Throw, Left-Hand Hook, Fast Curve, Change of Pace and Slow Balls

Baseball Pitchers Turn to Science in Effort to Stop Hitting

As a result of restrictions on the use of resin and other substances, "big league" pitchers are devoting more time than ever before to the study of ways of controlling the speed and direction of the ball. In its flight, the sphere is affected by the force with which it is hurled toward the plate, the pull of gravity and the friction of the air through which it passes. A curve is thrown by gripping the ball in such a way that a whirling motion is imparted as it leaves the hand. At first the pellet travels in a straight line because the force with which it is hurled is sufficient to overcome the effect of the spinning motion that tends to pull it out of its course. As the velocity decreases, however, the ball "breaks" into what is known as a curve. In their effort to puzzle batters and cut down the increasing number of safe hits, pitchers are perfecting new deliveries. One of these is known as a "slow" or "change of pace" ball. As it does not revolve at all, it seems to hang in the air. Another is called the "yaw yaw" or fork ball. According to the managers, however, freak pitching is on the wane and the thing in demand is the ability to pitch and control curves.

Motorcycle Driven by Propeller Has Seats for Two Persons

Driven along the road by a propeller run by a gas engine, a strange motorcycle has been made by an Illinois man. As it has no muffler, the sound is similar to that of an airplane motor. The propeller blades are

Motorcycle Driven over Roads by a Propeller Similar to That Used on an Airplane

inclosed in a wire cage to prevent accident. Besides carrying its owner at a good rate of speed, it also has a seat for a child.

Open-Air Roll Couch Adds Comfort to Camping Trips and Picnics

Weighing less than two pounds and as easily carried as a roll of music, an open-air couch has been devised for the convenience of campers, tourists and others. It is a strip of waterproof fabric, one end of which is raised as a head support and backrest by easily adjusted props. The entire couch can be rolled up quickly.

Couch Rolled Up and Extended; Supports Make a Compact Package Easily Carried

Ten Thousand Skulls Are Studied to Trace Origin of Indians

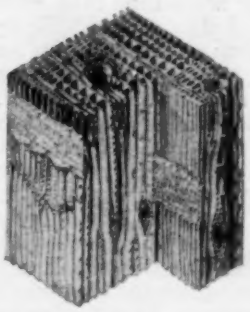
More than 10,000 human skulls are now in the possession of the National Museum at Washington. These relics are not on exhibition but are kept for special study. Measurements so far taken are said to have strengthened the belief of scientists that the North American aboriginals and peoples of eastern Asia are of the same racial origin. Further examinations are expected to disclose important characteristics common to the Alaskan Indians and the Mongolians. The face of the northern Indian has been found to be broader, attributed to the greater exercise of the chewing muscles in the men. Among the women there is said to be no such difference. The bulk of the collection represents North and South American Indians. It was started twenty-two years ago when 2,300 skulls were turned over to the institution by the army medical museum.

Statues Cast from Wax Mimic Life under Skill of Sculptors

By adding skillful touches of paint and imitation hair to the faces and heads of figures molded from wax, artistic sculptors who produce lifelike imitations of prominent people give the "studies" a natural appearance. After posing the forms in characteristic positions, the workers dress them in real clothes of the kind generally worn by the originals of the subjects. Plaster molds of wax heads are cast over clay patterns sculptured from photographs or living models. Into these shells, the molten material is then poured and left to cool. When the covering is removed, heads are adorned with hair, eyes are painted on, and other natural coloring is applied to imitate any peculiar facial features of the persons represented.

How Cells in Wood Carry the Sap Is Shown in Drawing

To show the cell structure of a minute block of soft wood, a drawing has been made by a scientist at the forest products laboratory. Representing a cube less than a quarter of an inch wide, the picture brought out the many tubular fiber units cemented together and having in their walls thin areas to permit the passage of the sap. Some of the interesting things shown are the horizontal "rays" that store and distribute the food material of the tree, and the vertical cells that carry the moisture.



Making Portland cement by a process discovered in Germany is said to result in a concrete which attains in two or three days a hardness surpassing that of the ordinary mixture after a lapse of four weeks. No details have been made public regarding the discovery.

Touching Up Clay Model for Wax Statue of Screen Comedian

Applying Tints of Paint to a Finished Head to Give the Figure an Appearance of Reality

Wax Sculptor with Life-Size Likenesses He Made of Abraham Lincoln, Walker Whiteside in the Role of "The Hindu," and Jackie Coogan, of Movie Fame

Removing Freshly Cast Forms from Their Plaster Molds and Trimming Rough Spots from the Surfaces; Left, Collection of Wax Heads Representing Characters Selected from Five Races of People

Copyright, Underwood & Underwood

Traffic Policeman Is Protected by Sentry Box in Street

To protect him from the weather, a Boston traffic policeman has devised a three-cornered sentry box that can be moved about easily and will not obstruct the streets where it is stationed. Built of gas pipe and canvas, the contrivance aids in attracting attention of vehicle drivers and

How Portable Canvas Sentry Box Protects Traffic Policeman in All Sorts of Weather

pedestrians, thus helping to assure the observance of signals. The bottom is made of strong wood for protection against snow and water, while the cloth sides ward off the wind. A canopy deflects rain and snow and acts as a sunshade in summer.

Sea Snakes "Capture" Ocean Vessel Anchored in Tropic Straits

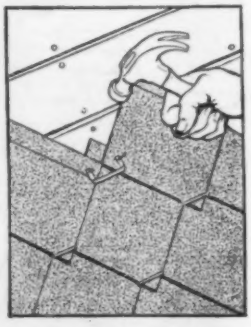
Although sea serpents are now generally conceded to belong only to the world of fables, there are approximately fifty species of snakes that make their home in salt water, some of them attaining a length of several feet. They are poisonous, and although timid under ordinary conditions, have been known to attack savagely when disturbed. When the S. S. "Ikala" dropped anchor in the Straits of Macassar not long ago, it aroused a school of salt-water reptiles that swarmed on board, crawling up the chains and hawsers. The ship was reported to have been held up several days before the snakes could be driven away. In many respects these reptiles resemble the land varieties, but have broad paddle-shaped tails, which enable them to swim rapidly after small fish.

Fewer Born While More People Die, According to Census Figures

Deaths in the United States for the first nine months of 1923 increased over the same period in 1922, while there was a decrease in births, according to statistics published by the government census bureau. All figures are prepared on the basis of each 1,000 population and show that, for the entire country in 1923, there were 12.6 deaths and 22.8 births, as compared with 11.8 deaths and 23.1 births in 1922. Montana had the lowest death and birth rates of all the states, the figures being respectively seven and 17.5. The highest death rate occurred in Vermont, with 15.8, while the highest birth rate was reported from North Carolina, with 30.2 for each 1,000 population.

Locks for Asphalt Shingles Hold All of the Corners Flat

By holding all corners of asphalt shingles firmly against a roof, locking brackets nailed over the edges of the sheets keep them from being dislodged by wind or curling up under the effect of weather. It is claimed the fasteners bind the roofing into a compact layer equal to a solid piece, and by preventing small openings, guard against the escape of heat from a building and entrance of cold. As the patented locks are made of zinc, they cannot rust or corrode, thus insuring a long life. Guide lines drawn on the shingles aid workmen to place them properly, and may be washed off after the roof has been covered.



"Practice Flat" Teaches Brides Way to Keep House

To teach management of a household to prospective brides and students interested in home economy, a "practice flat" has been installed by a Chicago school. Three pupils occupy the apartment at one time, to receive instruction in duties of housewives and maids in operating a home at the least possible cost. Arrangement of meals, appointment of interior furnishings and training of servants are some of the lessons the "apprentices" study while being given practical experience in the subjects of the domestic "schoolroom."

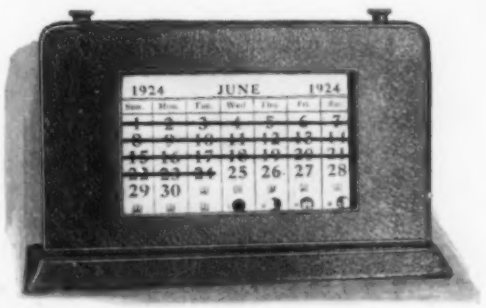
Student-Brides Receiving Practical Instructions in Household Science from Teacher in "Practice Flat"

Bogus Pictures Revealed by Lights

French experts are said to have perfected a method of identifying pictures by examining the canvas under groups of red, blue, green or white lights. Scrapings, retouchings, changes in signature or other alterations, are said to be brought out clearly. In one recent case of disputed genuineness, the method revealed that the artist whose signature the picture bore could not possibly have painted it, because a physical infirmity prevented him from using the brush as the painting showed.

Calendar That Cancels Past Dates Tells Time of Month at Glance

Correct dates are read at a glance on a calendar that cancels past days by broad red lines through the figures on cards for each month, inclosed behind glass in an attractive wooden or leather-covered case for the desk. The lines are operated by two knobs on top of the box, one to move them forward day by day and the other to return them in readiness for use again when the month is up. Only a new set of cards is needed each year, as the case can be used repeatedly and is claimed to last a long time. The end of the red line always points to the proper date and the relative number of past and future days is clearly registered.



Past Days Ruled Out, Calendar Plainly Shows Correct Date; Note Knobs on Top

¶More than 21,000 telephone operators, most of them women, are employed in New York City.

Electric Blower That Hoists Grain Eases Thrashing Labors

Thrashing-day labor is lightened and time saved by the use of a patented electric

Unloading Grain into Blower Fan at Bottom of Feed Pipe; Motor at Right

blower to hoist grain directly from the wagons into the storage bins, thus eliminating hand shoveling. Driven by the farm motor, a rapidly rotating fan inclosed in a sheet-metal chamber, sends the grain, dumped into a trough, up the feed pipe to the granary. The power of the fan is sufficient to raise the kernels twenty or thirty feet in a steady stream. A truck load of grain can be hoisted and stored in little time, without waste and at small expense.

Lost Gold Mines of Arizona Prove Lure to Fortune Hunters

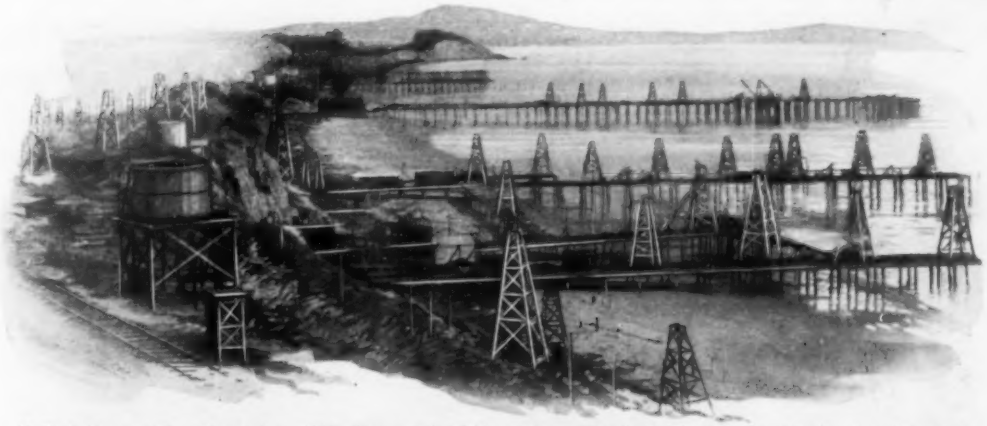
Of all the legends of buried treasure, the most persistent is the one about the lost gold mines of Arizona. Only the Indians are supposed to possess the secret of this baffling mystery, although the story has been circulated for more than a century. That there once were mines in the region is indicated by references found in early Spanish diaries and by the tales passed down through several generations of natives who were compelled to dig the ore as slaves of their conquerors. The chief evidence in support of the tradition is the altar of the San Xavier mission, not far from Tucson. It is described as being "inlaid with virgin gold." Mission records show that the precious metal was brought from Canada del Oro where it was mined by Indians under the direction of Spanish priests. But no trace now exists of the diggings, and the old trail over which the gold is said to have been carried by pack mules disappears abruptly in the sands.

SPEED KING DRIVES AUTO ON SIDE OF WALL

Speed Rider on Motorcycle Running on Vertical Track

Automobile Starting Its Climb to the Side of the Wall

Driving an automobile or a motorcycle at terrific speed, a stunt rider appears to defy the law of gravity by running his machine on a perpendicular track. Beginning the race on a level floor, the car, rapidly gaining velocity, is sent upward to the fencelike course, where it whirls along the vertical path as steadily as on an ordinary highway. The wall track is built of wood to insure a secure grip to the tires of the fleeting machine. Descent from the perilous roadway is made at the same lightning speed as that attained to climb to the height.



Drilled Twenty-Five Years Ago, This Ocean Oil Field at Summerland, California, Has Produced a Constant Flow, Although the Wells Are Not Over 500 Feet Deep

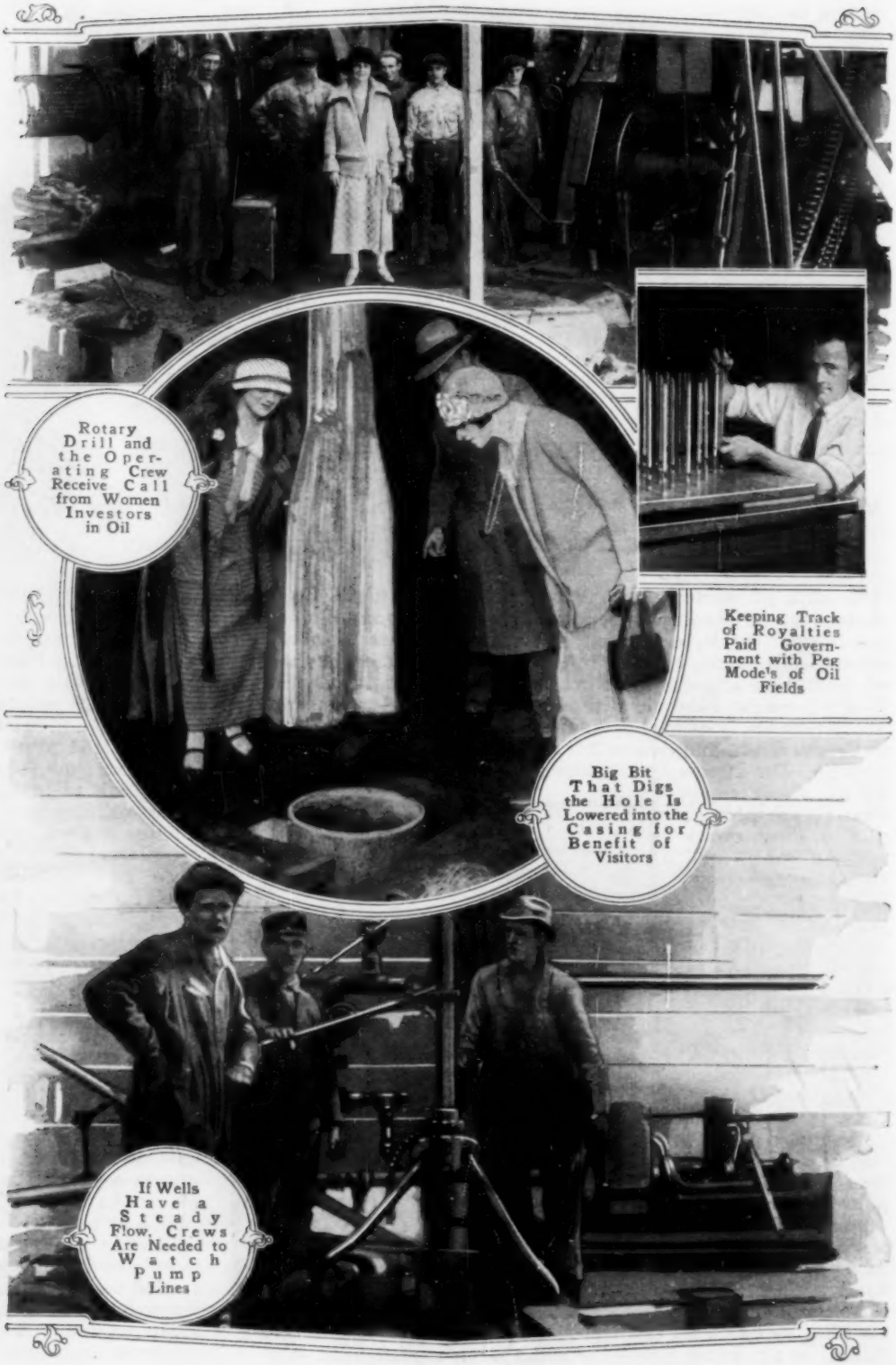
From Flowing Gold to "Dusters"

Mile-Deep Oil Wells Replace Shallow Holes of Old Day While Chance Enters "Game" Despite Better Methods

IN spite of modern rotary drills, steel derricks and scientific exploration of "suspected" fields, chance still seems to operate as a strong element in the success or failure of a prospective oil "gusher." Wells brought in with a production of many thousands of barrels daily often die down overnight and deliver but a few gallons an hour after a spectacular performance that may bring prospectors and drilling crews rushing pell-mell into the surrounding fields. More than anything else, drilling for oil often proves a costly and hazardous enterprise, resulting in only a series of "dusters," narrow worthless holes thousands of feet deep, into which the time and labor of scores of men have been poured in hopes of tapping hidden reservoirs of the rich fluid. On the other hand a gusher, always a wonder even to the veteran driller, may burst forth to pour its liquid wealth over the surrounding land. When this happens, crews of workmen are set to the task of digging basins in the ground to hold the flow. Laboring feverishly against the fluid rush, sometimes many such reservoirs, called "sump holes," are hollowed out of the ground to care for the promised oil, only to find the flow suddenly decreased to the most ordinary production. Immense territories have been covered with great concrete bowls hastily built to accommodate future volumes of oil as indicated by early results of entire fields, and pipe lines have been laid over long and rugged routes to carry the liquid away, only to lie idle and wasted as the area peters out to a scant few barrels a day.

First Oil Well, Sixty-Nine and a Half Feet Deep, Drilled in 1859 in Pennsylvania

Where wells drilled in the old days seldom extended farther than a few hundred feet, those put down now are sunk from 5,000

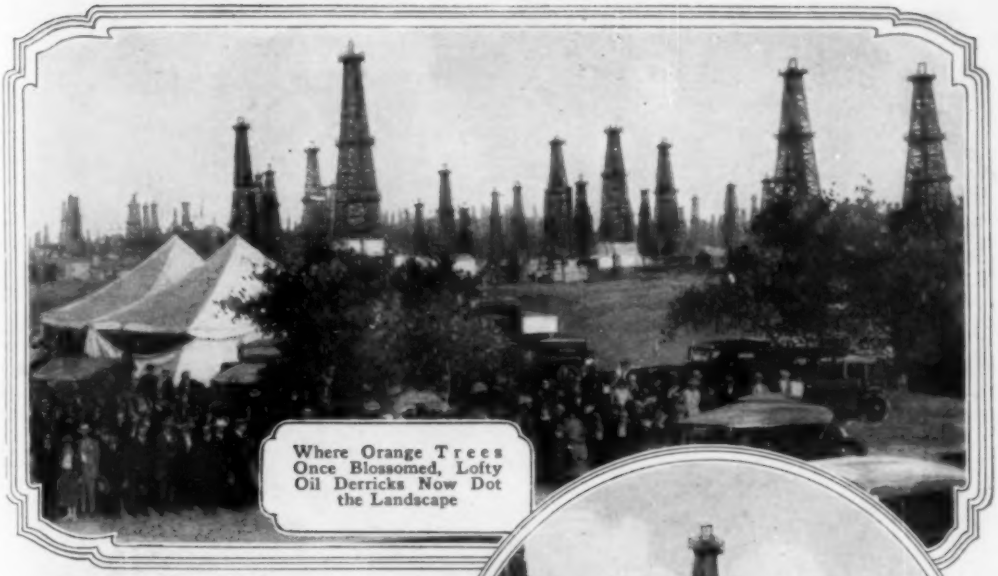


Rotary Drill and the Operating Crew Receive Call from Women Investors in Oil

Keeping Track of Royalties Paid Government with Peg Models of Oil Fields

Big Bit That Digs the Hole Is Lowered into the Casing for Benefit of Visitors

If Wells Have a Steady Flow, Crews Are Needed to Watch Pump Lines



Where Orange Trees Once Blossomed, Lofty Oil Derricks Now Dot the Landscape

Tall Pyramids That Mark the Ceaseless Quest for Veins of "Black Gold"

Wealth by the Barrel Bursts from the Gusher, Flooding Surrounding Derricks with Torrents of Oil

To Catch the Flow, Temporary Earth Reservoirs Are Hastily Constructed

Fire, the Greatest Fear of the Oil Man, Is the Ruthless Invader of Wells, Tanks and Refineries

Gushers, Touched by a Spark, Become Roaring Geysers of Flame

Fire Fighters Attack with Streams of Smothering Liquids to Halt the Flames

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Top Picture Copyright, Ewing Galloway

Ten Thousand Chicks in One Hatch at Southern Poultry Farm

At almost the same instant, 10,000 baby chicks started tapping their way out of their shells and into the world at a large poultry farm in Georgia. The incubators, with an individual capacity of 150 and arranged in long rows, are filled every 21 days with 15,000 eggs. They are warmed with hot-water pipes and great care is taken to maintain an even temperature. When some of the baby chicks are only a day old, they are sent by parcel post to chicken raisers in neighboring towns, the post office department giving this class of shipment preference over other matter. Many are kept for breeding purposes or are raised for sale as broilers. More than 1,000 eggs are gathered daily at this farm and after being graded and sorted are sent to supply city hotels and other large markets. In the last few years, the United States department of commerce has rendered important service to the poultry and dairy industries of the country, to large and small farms alike. Last year, the export and import business in these lines amounted to $80,000,000, an increase of $19,000,000 over 1922.

Loads of Eggs Are Gathered Each Day at Big Poultry Farm

One of the Ten Thousand, and Eggs Graded for Sale

Day of Glass Houses Near at Hand; to Be Cheap and Germproof

Glass houses may be a reality within the next fifty years if the expectations of scientists now working on the problem in Europe and America are fulfilled. Recent experiments are said to have resulted in the production of an inexpensive, easily made and practically indestructible substance which gives every promise of becoming a first-rate building material. The transparency associated with glass disappears under a treatment rendering the substance thick and opaque. At the same time, it has wonderful decoration possibilities in the way of coloring. One difficulty is said to be proper insulation to prevent extremes of temperature and another is brittleness, but these obstacles are expected to be overcome. The widespread use of glass for cooking utensils, for shelves, table tops and other purposes is taken as an indication of the possibilities of the material. Glass floors have been installed, and not far from New York there is a stretch of road of natural glass.

¶Incased in a mass of ice, a deserted three-masted schooner was found by a steamer rounding the Horn not long ago.

COMMENT AND REVIEW

Higher Education and Patriotism

THE earliest colleges in this country were founded on patriotism and religion, the latter being the corner stone. For perhaps a century the two continued hand in hand. Then came a time when new institutions of learning were created, which announced that while they, too, were for religion, they were independent of any sect. Later, in public schools, state universities and independent colleges, the religious feature of educational policy was distinctly disclaimed. And yet all these seats of learning were still avowedly patriotic. The next step was the exchange of professors with other countries. Some of these brought with them, and taught, gods strange to primal American principles. Also came greater liberty of personal views by professors, some of which were merely mild fallacies, but others were extreme. I do not mean to say, of course, that foreign ideas wholly dominate any one prominent college, or that every college has them to a really harmful extent, or perhaps, even at all in some cases. But at least there has been enough to cause fathers grave anxiety, and there has been mighty little public rebuke from college presidents.

Religion, as one of the two fundamentals years ago, has practically ceased to function in the modern college except in Roman Catholic institutions and such as professedly train for Protestant ministry or missions. But we have trusted our colleges to at least turn out patriots. Their answer to the call has ever been instant and inspiring. Is patriotism now to follow religion into the discard?

Faculties seemed to shrink from either positive action to stop these unsound ideas or to reprove them. They rather boasted that free speech by unsound men to beardless youth glorified free speech and matured the youth. They seemed to ignore the fact that youth is impetuous and heedless of personal consequences, as well in thought as in athletics. Can it be expected in the majority of students to question or doubt statements made to them under the auspices of a college they worship, and which could do no wrong? Also, these lectures were often altogether one-sided—the professor's side—and were taught as facts and not offered as debatable questions. The radical professor could see only his side; how could he be expected to suggest doubt in his pet idea?

From earliest history, men, and women too, have fought, bled and died for their country. Thousands have even died in defense of the personal good name of some ruler, or the bones of ancestors. Revolutionary heroes sacrificed everything and went barefooted in winter at Valley Forge. For us. The same spirit was revealed through the long, bitter years of the Civil War, that the flag they inherited should continue to float over an undivided nation. For us. The boys who went across seas did so to preserve the same country. For us. Men have toiled all their lives to pile up millions that colleges and universities might have lands and buildings, teachers and libraries, vastly greater and better than they ever had, in order to provide the greatest possible opportunities for the young men and women of today. To what end?

And now an orgy of heretical independence, imported from a land where peace and justice and mercy have fallen to the lowest ebb of any so-called civilized country, is being preached, excused, defended and declared by some students and recent graduates. Young men and women, abandoning all sense of obligation to those who have made possible the best living conditions in the entire world, are shouting frantically from platforms, "Under no circumstances will I fight for my country." Not only from secular platforms but from some pulpit platforms, abetted by clergy itself, comes the ignoble boast, "Let my country look

out for itself. I will not raise a hand or voice to defend it." I wonder would these same persons refuse to lift a hand in force to defend a sister's honor or a mother's gray head? Is country so much less beloved and honored? Has it done so little for these traitors to it? Is it as short-lived, so less deserving that its perpetuation is of less importance to its own, and the whole world, than even a sister or mother?

It is discouraging that young men and women students or graduates—because they are of more than average intelligence—can come out of any college filled with or ripe for such bolshevism. If they did not get the basic idea there, at least it was not anticipated and taught out of them in advance. Of course, the great student body of the country is still patriotic, and the very great majority of presidents and professors. All honor to such self-sacrificing and devoted men; but why should there be any? Thus far their numbers are not great, but unchecked they may grow.

Turn the traitors out!

What is most alarming and raises doubt and anxiety for the future, is that these utterances and rabid boasts appear to pass without any word of reproof or condemnation from the heads and official mouthpieces of the institutions to which these "advanced thinkers" belong.

If presidents are indifferent, or fearful, or wobbly, what are the trustees doing?

* * * * *

Voices in the Wilderness

ONE cannot cross our great western plains by railroad or motor car and fail to note the number of radio aerials. Life on our vast plains is still largely that of the pioneer. Hundreds of little ranch houses, with only a few rooms, stand out as solitary landmarks on the treeless desert stretching to far away foothills or the horizon. One, sometimes a few more acres, where a water well or some irrigation ditch has converted the dreary waste into a little oasis, may be miles from the nearest neighbor's shack. At intervals along the railroad, as though hanging on the edge of the great world of action far away, are three or four small houses, or perhaps half a dozen. And again, villages of a hundred or two population. All these people are toiling to produce something useful the world must have. Few schools or churches. No movies, no lectures, no public libraries, no theaters. Absolutely nothing to alleviate the awful monotony of daily work. If in sight of a railroad, the occasional trains are watched wistfully until they disappear from sight. Such was the life of thousands until radio appeared, bringing far-off voices with song; news of what has happened in the last few hours in all parts of the world; the mirth-provoking tale; the price of grain and cattle in the world's marts; suggestions for a better home life; sermons; lectures; even bed-time stories for the little ones. It was as if the windows of the little adobe hut had opened into the halls of the mighty, with music and dancing and an endless variety of instruction and amusement. Even in the remote hills the solitary sheep herder, many of whom have lost their minds just for want of a single human voice, now has something new each day to think about, and impatiently awaits the setting sun, marking the end of his day's work, when he, too, can listen in and forget his terrible isolation as he picks up one distant city after another.

Newspapers, magazines, technical publications, are educational, but none of them are free. All these—except for school children and public libraries—call for an individual payment each time.

But with the radio receiving set within reach of millions, its owner and his family and friends can pick up, several hours each day, talks and lectures on the most practical and useful subjects without cost and without leaving the

home. How to cook, how to care for the body, the garden, the home, the farm; how to render first aid in accidents. Only the other night I listened to an eminent surgeon who told how to make a splint from a newspaper for even a serious bone fracture. It was so clearly given, I could now do it. So could thousands and thousands of others who also listened in.

Examples could be extended into pages, but are unnecessary. We all know. If our congressmen and senators would spend more time listening to the radio than to each other, they would not only be much better informed on the practical questions of everyday things that enter into the actual life of the people, but they would never dare dream of taxing radio at this time. Shame on the man who introduces such a bill. Shame on any committee which reports it out. Shame on every legislator who fails to denounce and vote against it.

One of these days the long-suffering people at home will demand and get a broadcasting set in the senate and house. It will come hard, but it will come. And then there will be a great awakening in all the country, when the words and public acts of the men they have chosen to a high office become an open book. The high-minded and sincere men on Capitol Hill will welcome and profit by it.

All this, and much more, one sees in a pair of crooked poles connected at the top by a crooked wire, with another crooked wire leading down through a small window below. If Santa Claus came daily to that little hut, he could never bring such gifts as follow that bit of wire. Nor can one fail to feel a surge of gladness that so much of joy, and courage and companionship, is being received daily and far into the night by those whose environments have so long been cheerless, discouraging and isolated. Surely radio is the fairy godmother with something for every need, yet whose gifts are priceless.

H. H. WINDSOR

May 1, 1924

Rifle, Rope and Husky Native Crew Assisted Sportsman in Capturing This Huge Crocodile

Crocodile, Once Object of Worship, Now Eagerly Sought by Hunters

Worshiped by the ancient Egyptians who believed that their appearance at times when the Nile overflowed its banks was connected with the fertility of the soil, crocodiles are now hunted by sportsmen in search of big game and thrills in African and other tropical jungles. Like the tiger, these reptiles, once they have acquired the taste for human flesh, are said to become savage man killers and they are greatly feared by the natives. Basking in sluggish streams or on the banks of the rivers, they are sometimes harpooned and captured alive with strong ropes or killed with high-powered rifles. They are distinguished from alligators by their longer and narrower snouts and by the fact that their lower teeth fit into notches on the margin of the upper jaw and not into pits as is the case with the American reptile. Their skins are used for leather and they are still plentiful, many of them being encountered in the Victoria Nyanza, the huge fresh-water lake that supplies the headwaters of the Nile.

Model of Sunken Liner Aids Divers in Hunt for Treasure

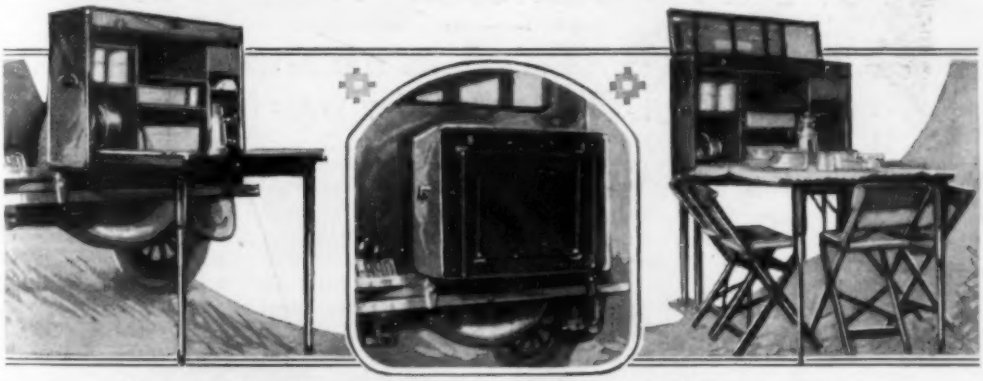
To show the exact position of the ship as it lies on the bottom of the sea, a model of the "Laurentic" has been made by a British sculptor. The vessel was sunk by a submarine in 1917 and several millions in gold already have been recovered from the hold. The miniature is expected to aid the divers in their search for treasure.

¶Estimated at eleven and one-half miles lower than the top of the world's highest peak, Mt. Everest, what is said to be the deepest spot in the ocean is 32,088 feet below the surface, about forty miles north of one of the Philippine Islands.

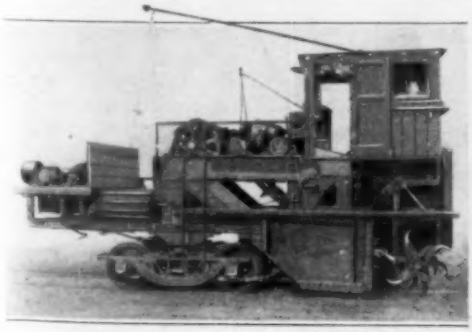
Model of Treasure Ship Showing How It Rests on Bottom of the Ocean

CAMPING OUTFIT FITS IN REAR OF CAR

Cooking utensils, dishes, a galvanized ice-box compartment, storage space for food and a table, are included in a practical cabinet outfit designed to be attached to the rear of the automobile while camping or touring. The table part becomes the door to the cabinet when it is folded up. Legs fit flat on the outside of the box when it is closed and fastened to the car. It is made in three sizes, and has an additional convenience in the form of a toilet outfit held on a hinged cover to the top shelf.



Complete Cabinet Camping Outfit, Including Ice Box, Fitted in Rear of Automobile



Electric Snowplow with Steel Claws in Front

Steel Claws on Snowplow Quickly Clear Tracks of Ice

With sharp steel claws attached to a revolving bar, an electric snowplow chipped out the packed and frozen ice on 900 miles of track of an eastern electric railway last winter. As the chunks were cut out, they fell upon a belt conveyor, and were dumped along the right of way. The plow weighs approximately 80,000 pounds, can bore through heavy drifts at considerable speed, and saved the hiring of scores of workers to remove the ice between the rails.

Pottery Market in Peru Village Where Women Dispose of the Sturdy Wares They Helped to Make

Art of Old Incas Lives in Andean Pottery

Descendants of Mighty People Spend Hot Seasons at Potter's Wheel and Baking Kiln Molding Clay Ware for Markets

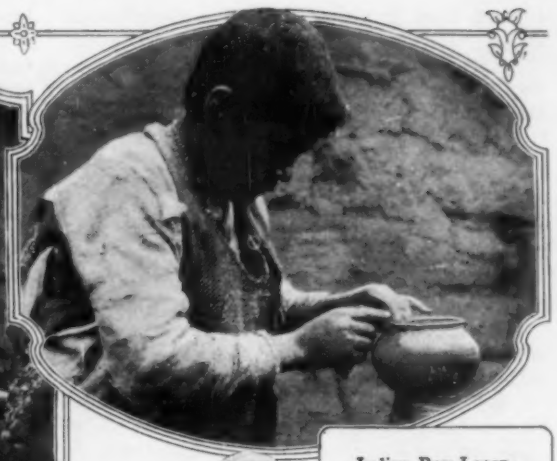
AT the time of the Spanish conquest of Peru, early in the sixteenth century, pottery making among the Incas had probably reached the point of greatest artistic development and is now the predominating art practiced by the remaining few of that once mighty people. Were it not for the fact that homemade pottery is one of the prime essentials of his existence, it is believed the Peruvian native would probably have given up this craft long ago.

Most of them today, like their forefathers, are given to agricultural pursuits. On the lofty plateaus only a few degrees south of the equator the temperature changes but slightly. Torrential rains represent winter and drouth marks the summer. It is in the dry months when his planted crops are maturing that the native devotes his time to making pots and bowls, for his economic condition is such that they take the place of all the household utensils of daily life. Pottery making on a commercial scale is conducted principally by the Quichua Indians of Bolivia and Peru. They are the laboring class and represent about ninety per cent of the population. The workman digs clay in the hills and stores it in a pit in a moist state. Beside the storage pit is a large flat rock. Batches of the clay are placed upon this stone and pounded, rolled and kneaded until it reaches the proper consistency for molding pottery.

German Potter Setting Decorated Crockery in Baking Oven for Glazing

The pottery wheel upon which the vessels are shaped is a strange affair of wood and stone. The shaft running through the counterbalance, or "kicking" wheel, rests upon a grooved stone. The top is a knob of hardened clay. Upon this the potter places his batch of fresh clay, kicking the wheel at the rate of about 100 strokes a minute to obtain the proper speed for spinning the clay into form. He roughly shapes the outside of the clay with his hands, flicking water upon it from time to

Glazing the Unbaked Jar with a Pasty Mass; a Sharp Bamboo Stick Removes Jagged Particles from the Surface



Indian Boy Learning the Art of Pottery Making; Many Become Experts

Woman Clay Worker Placing Handles on Freshly Molded Pots; Using Fingers to Shape Strips

Crushing Bits of Antimony, Gathered from Rain-Washed Hills, into Powder from Which a Hard Finish Is Made on the Vessels

Making a Bulge by Working the Soft Clay Gradually toward the Center with His Thumbs

time to keep it moist. With his thumbs the spinner puts a bulge near the top of the jar, then works it downward to obtain the correct shape. The rapid circular motion of the table enables him to give symmetry to his product. When the rough shaping is completed, he takes a small piece of bamboo and puts on the finishing touch. The stick removes any sharp particles on the surface of the jar and the holes they leave are filled with clay. The final task is to cut off the jar at the bottom with a piece of hard string or a length of wire.

As the jars are completed, the artisan's women folks fashion handles of clay and attach them with deft fingers. The women show marvelous dexterity in this work, for no molds other than the hands are used in working the handles and they are attached "by eye," with such precision that it would take a delicate instrument to find any variation in the balance. After drying in the sun, several hundred vessels are accumulated for glazing to make them waterproof.

From the mountains the natives obtain small bits of antimony left exposed on the rain-washed hillsides. From the creek and river beds other small bits of lime are obtained. Lime and antimony are crushed with heavy stones and the combined parts mixed with water to the consistency of paste. This paste is smeared upon the inside of the pottery and burned.

The kiln is made of mud with a false bottom for a floor, beneath which the fire is built. It is then filled with pots and the top covered with defective or broken earthenware. Mesquite or sagebrush is used for burning, as the oil in the brush assures an intense heat. About three hours' baking is sufficient to temper the pottery and fuse the glazing compound, after which the fire is drawn and the kiln allowed to cool. When he has ready several thousand of the finished jars, the native packs them in rawhide nets, dozens to the package, and transports them over the mountain roads to markets from where they go to all parts of South America.

Vitamine Discovery May Show Way to Produce Synthetic Food

Much interest has been aroused in medical circles by the announcement of Dr. W. H. Eddy, of Columbia university, regarding the first isolation of any of the five known vitamines. Dr. Eddy's success in separating vitamine D, or "Bios," scientists believe, opens up the possibility of producing synthetic foods of high nutritive value by chemical processes. Further experiments are being made to determine the exact composition of the vitamine.

Indian Potter Tying Finished Jars on a Burro with Rawhide Netting for Transportation over Rough Mountain Roads to Lowland Cities for Shipment to Other Countries

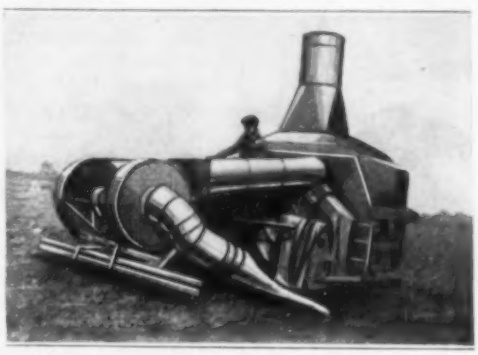
Scientists in Laboratory Seeking to Save Forests and Increase Farm Yield by Devising Ways of Combating Insect Pests, and Methods of Stimulating Growth through Fertilization

Forest Drain Greater than Growth by Three Hundred Per Cent

More timber was cut from the national forests last year than ever before, according to a government report, the receipts from sales totaling $2,641,244. Attention was called to the steadily increasing drain on the country's forests amounting to 25,000,000,000 cubic feet with growth replacement only one-fourth of this amount. Future needs, it was said, must be met from timber lands of the United States, and substitutes and economies in utilization will only partially offset the normal increase in demand. As much wood should be produced permanently as is needed now, the report stated, adding that if all American forests were given adequate protection against fire, and elementary practices in forestry introduced, the present annual growth could be increased to about 14,000,000,000 feet, or a little over half the present requirements. To provide against a shortage of supply from Canada, it is proposed that a pulp and paper industry be established in Alaska. A survey now is being made of the pulpwood resources of the United States.

Vacuum Cleaner for Fields Stops the Wasting of Seeds

Picking up scattered seeds in rough alfalfa fields after the crop has been cut, is accomplished by a machine that works on the principle of a vacuum cleaner. It is fitted to a tractor, the motor of which operates two fans. The suction created picks up the fallen seed as well as the unthrashed pods, thrashes the seed out of the pods, and delivers it to a bag at the side.



Giant Vacuum Cleaner in Action Picking up Scattered Seed from Alfalfa Field

Portable Canvas Cot for Campers Folds into Small Space

For the convenience of campers and for hospitals, a compact folding cot has been patented. Its frame is of light steel tubing.

Inventor with His Cot Packed in Handy Carrying Case and Unfolded

Rollers at one end stretch the canvas top tightly. The entire cot may be knocked down into a package three feet long and it can be set up in six minutes. It weighs only thirty pounds.

Plane to Fly without Propeller

With aviation still in its infancy, inventors are busy on different types of machines, one of which is designed to be driven by the escape of gases in the rear instead of by a propeller. The idea is not new, but heretofore it has been considered too inefficient. Now, however, a French inventor is reported to have overcome the main difficulties and to have interested the government in his efforts.

Knotless Hook Holds Up Line without Need for Tying

For use where a line is put up and down frequently, a hook has been made which holds a rope without tying. It can be screwed to a wall, and the line is secured by simply slipping the rope around the prongs. The harder the pull, the tighter the rope is held.

Toy Balloons as Weather Scouts Guard Lives of Airmen

By tracing the paths of winds with small brightly colored balloons, observers in sixteen government weather-bureau stations in various parts of the country, obtain information concerning air currents and weather conditions for the guidance and protection of airplane pilots and others. The balloons are from two and one-half to three feet in diameter, are generally filled with hydrogen and are released twice daily during observation periods. As they soar aloft, skilled observers with telescopes note their direction, speed and height as long as they can be seen. The findings are compared with reports received from other stations, and from all the data obtained, a wind chart for the entire country is prepared. The balloons drift great distances and have been known to reach a height of twenty miles.

Ten-Gallon Vacuum Bottles to Save Much Ice in Shipping

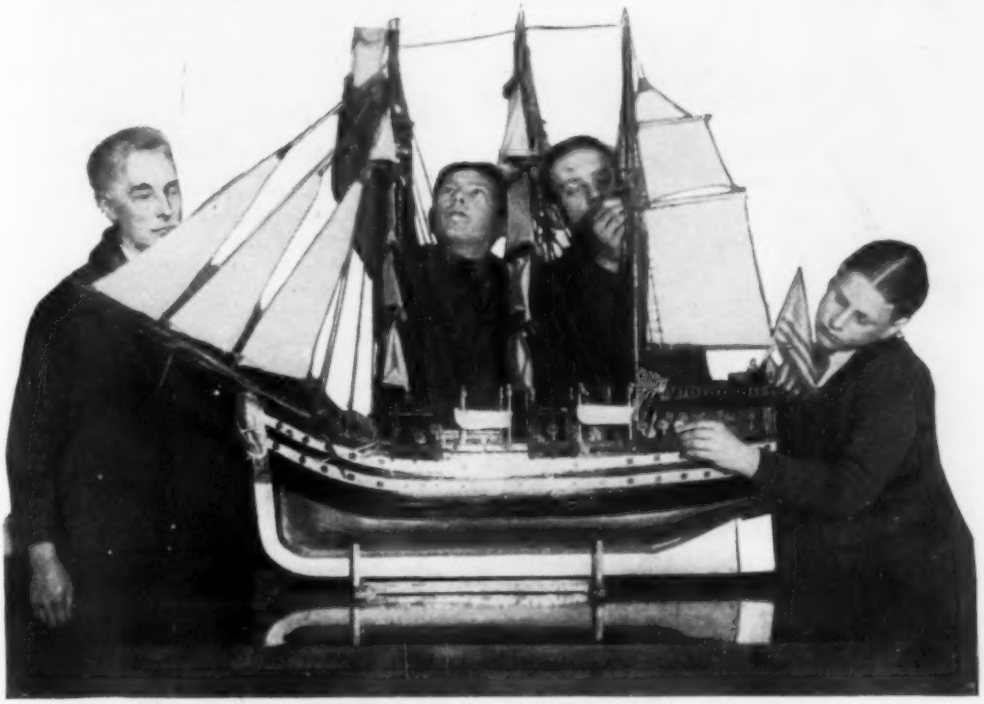
Vacuum bottles in five and ten-gallon sizes for shipping ice cream, cold liquids of all kinds, or hot foods, have been patented. They are constructed of two walls of thin steel coated with liquid glass, which is baked at a high temperature until it is

Vacuum Bottle Large Enough for Shipping Bulk Ice Cream or Other Perishable Goods

thoroughly fused with the metal surface. These large containers are said to provide a practical shipping case for frozen goods without packing them in ice, and for the delivery of oysters, milk, ice cream, and other foods that must be kept at high or low temperatures. They weigh less than a shipment of the same size packed in ice.

Art of Whittling Revived by Contest to Try Schoolboys' Skill

In a competition conducted among Chicago schoolboys for the cleverest and most accurate samples of whittling, many pupils sought to disprove the theory that the good old Yankee art is being forgotten. A wide assortment of articles, from airplanes to rowboats, houses and toys were offered for the exhibits. Accuracy in detail and proportion and ingenuity in making the most out of a single piece of wood, were the features displayed by the boys' work. In carving the ship shown in the illustration, the boys had the assistance of an old sailor, but many of the objects were done entirely without help. The contest was followed by one to see which boy could make the best and most melodious whistle from a willow-tree branch.



Model of Three-Master Whittled by Schoolboys Who Were Aided by Old Sailor

Germs Identified by Way They Eat and Preference for Food

By studying the way various germs consume different kinds of food, scientists in the laboratories of the United States public health service are enabled to identify them and test the strength and purity of serums and vaccines. Many of the small organisms cannot be told apart under the microscope, but their appetites, it is said, reveal their true character. Each week, more than a hundred pounds of beefsteak, eggs, potatoes, gelatin and different kinds of sugars are prepared for the millions of little "bugs" constantly under observation. Every particle must be carefully weighed and measured. Cultures of certain kinds of germs are kept for reference, and when there is doubt as to the character of new arrivals, their appetite is compared with that of a known specimen.

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L. J. Bender, Public Health-Service Expert, Preparing Food for Germs in Government Laboratory

Mail Box of Concrete Combines Beauty with Utility

Combining utility and attractiveness, a concrete rural mail box designed by the

Concrete Mail Box for Rural Routes that Is Proof against Weather and Rust

postoffice department is said to be proof against the weather and rust. Providing ample space for the postal matter of three persons, the container has an overhanging roof to prevent rain or snow from seeping inside. The supporting pedestal of the same material is molded to the box. Entrance is gained through strong metal doors securely fastened in the cement.

From Banknotes to Battleships Is Course of Money Plates

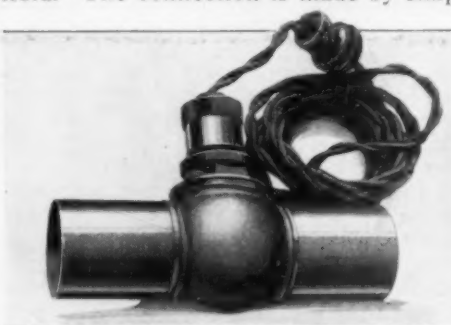
From banknote plates to battleship castings is the path taken by much of the steel used by Uncle Sam in printing stamps, government notes and paper money of all denominations. Each year, thousands of plates used for this purpose are scrapped, melted up and molded into yokes for eight-inch guns, castings for torpedo tubes and many other things. Before being discarded, the plates are watched as carefully as money itself. They are sent to the different departments each morning and returned at night to the custodian of the original dies, which are never destroyed. After making about 50,000 impressions, the delicately engraved lines become worn so that further printing with them would be unsatisfactory. Under the direction of a committee of three officials appointed by the secretary of the treasury, the destruction and transformation of the plates take place. Not long ago, more than twenty tons of metal were taken from the vaults, hauled to the foundry of the United States navy yard and there "cremated" under the watchful eyes of the committee.

Photos in Darkness Reveal Secrets Concealed in Electric Flash

Some of the mystery that surrounds the world of electricity may be dispelled by an invention for taking pictures of electrical disturbances of various kinds. Surges and impulses that last only twenty-billionths of a second, an interval that would give light time enough to travel only twenty feet, have been made to record themselves in beautiful shapes and patterns in absolute darkness on a photographic plate in the apparatus, the invention of an engineer.

Auto Heater Built in Water Pipe Costs Little to Operate

To prevent freezing of the engine of an automobile kept in a cold garage, an electric heater has been patented that is attached permanently to the water manifold. The connection is made by simply



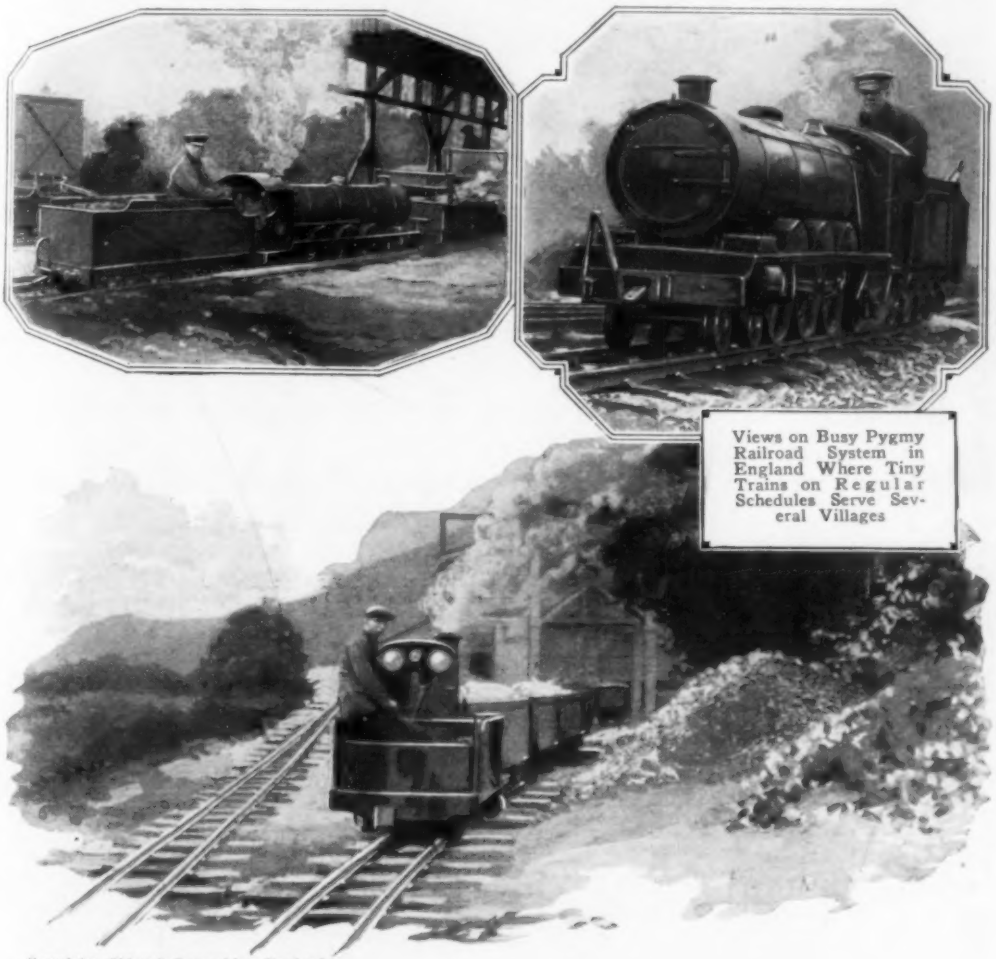
Electrical Heater that Is Permanently Attached to the Water Manifold of an Automobile to Prevent Freezing

lifting the hood and inserting a plug. The warm water automatically circulates through the radiator and motor, keeping them at an even temperature regardless of the weather. As it is not necessary to heat the entire garage, the cost is reduced, and, as the warmth is confined directly to the place where it is most needed, easy starting in the morning is assured. The expense is estimated at about five cents a night.

PYGMY RAILROAD LINE DOES GIANT'S WORK

Serving several small towns in Cumberland, England, a 15-inch-gauge railroad system, seven miles long, maintains regular passenger, express and freight schedules. In addition, the line has been used profitably to develop a granite quarry. Passenger trains have from six to eight coaches fitted with windshields for the protection of the occupants. Freight and hauling travelers from the main-line junction into the scenic part of the region.

At the granite quarry, two and one-half miles from the main road, a stone crusher and sorter was installed to dump the material directly into the small cars. Without the tiny railway, the quarry could not be operated successfully because of its remote location. The pygmy line is the only

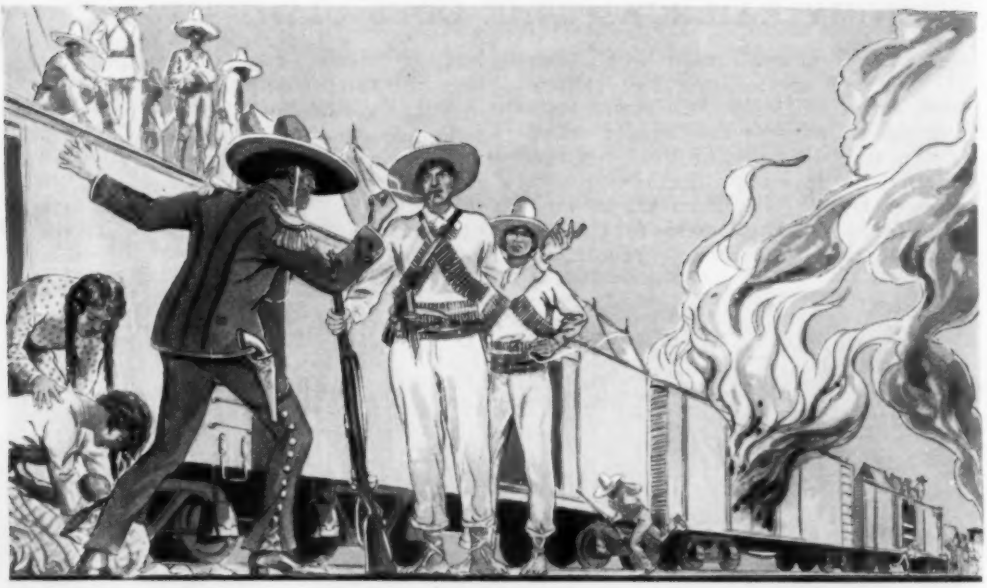


Views on Busy Pygmy Railroad System in England Where Tiny Trains on Regular Schedules Serve Several Villages

Copyright, Oldroyd, Lancashire, England

stone trains usually have four cars. Models of the fast "Atlantic" type locomotives used on English lines do all the work. They have a tractive force of 680 pounds, are nine feet six inches long over all and burn coal. The railway was begun thirty years ago and one of its engines, the "Ella," has been in constant service for twenty years. In the summer months, the line does an extensive tourist business, means of transportation to residents in several of the small villages and hauls their coal, food, mails and all supplies.

¶To protect London from attack, a defense plan has been prepared which extends 30,000 feet above the earth. Great areas of the sky will be so "mined," netted and barraged, that it will be impossible for aerial raiders to penetrate the area.



Peaceful Industries Were Often the Principal Sufferers Where Chance Placed Them in the Path of Destructive Elements of Mexican Revolutionists Who Ruthlessly Destroyed Valuable Public Utilities

Mexico—The Treasure House of the World

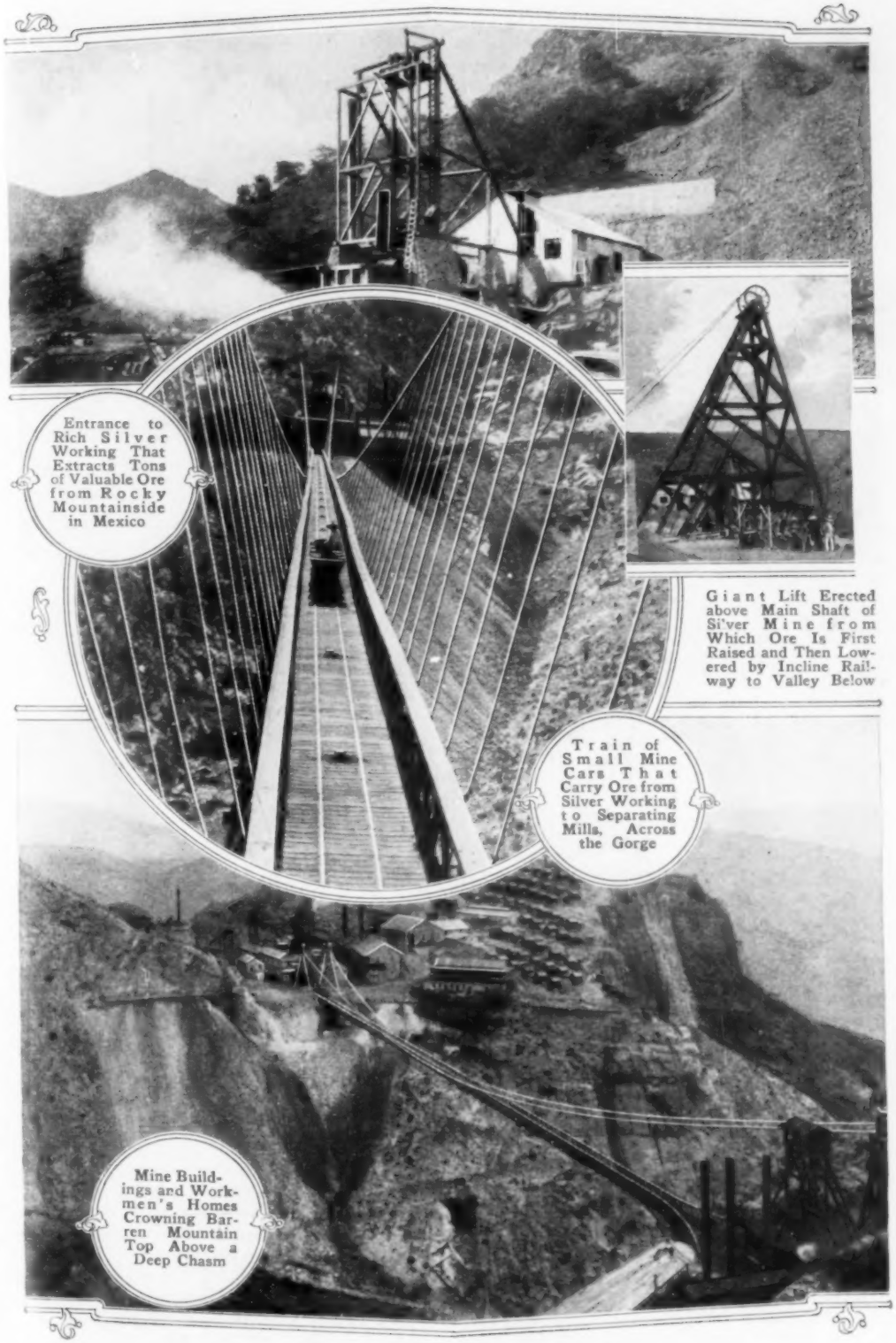
Fabulous Stores of Natural Resources Long Locked in Rock-Bound Vaults of Earth Await Magic Touch of Industry

ONCE said to be the salvation and resurrection of Old World empires, Mexico, teeming with land-locked wealth, despite thousands of operations opened up in past centuries, remains a gigantic treasure house pouring its richness into eager markets in all corners of the globe.

During the first seven months of last year the daily production of oil reached volumes never before equaled in that region, while 1,770 tons of silver were taken from the mines. Upward of 1,000 copper mines, operating with a steady untiring hum, help to swell the enormous mineral production to figures undreamed of by the ordinary observer. With the exception of three states, every section of Mexico has mines of some kind. An estimate places the total number of workings at 21,000, giving employment, when in full operation, to over 500,000 people.

With all of these efforts to garner the wealth of the country for the lap of civilization, it is said that three-fourths of the republic's resources remain untouched. With conditions changing and a steadily growing demand for raw minerals, registration of mining claims is on the increase. The average for the past few years has been 5,000 records annually, which include new stakes in all of the various metal fields. During the latter part of the eighteenth century, Spaniards discovered the site of Real del Oro (Gold City), now the greatest gold-mining camp in Mexico. About 1825, the place grew in prominence, when it began to attract the attention of miners all over the world by the unequaled richness of its output. Adventurers, fortune hunters and prospectors flocked to the little town, all eager to confront most trying hardships in quest of sudden wealth. Today more than a score of modern-equipped and operated workings are scattered over the hills that surround the camp, and the output of precious minerals is perhaps greater than that of any other of the rich mines in the country.

Many of the ores are found in tiny deposits hardly visible to the eye, buried in quartz through which a sulphide of silver winds in ribbonlike streaks. Science, aiding man in his untiring quest, has brought electricity to feed power to machinery which grinds the glittering yellow specks from the flinty rocks, and the mountainous



Entrance to Rich Silver Working That Extracts Tons of Valuable Ore from Rocky Mountainside in Mexico

Giant Lift Erected above Main Shaft of Si'ver Mine from Which Ore Is First Raised and Then Lowered by Incline Railway to Valley Below

Train of Small Mine Cars That Carry Ore from Silver Working to Separating Mills, Across the Gorge

Mine Buildings and Workmen's Homes Crowning Barren Mountain Top Above a Deep Chasm

Bands of Itinerant Soldiery Sometimes Beguiled Needed Labor from Fields and Mines, Paralyzing Trade and Leaving Machinery and Material to Ruin

region is crossed with a network of transmission lines.

Following the discovery of the first silver mine by Spanish explorers, who traded for it with the Indians, a settlement was established about what is now Mexico's largest silver-mining operation, Pachuca, in the state of Hidalgo. The neighboring hillsides are honeycombed with tunnels, and terraces of tailings have piled up over a long period of centuries, under the untiring labors of thousands of diggers. It it claimed that one of these mines, the old Trinidad working, gave up twenty millions of dollars' worth of silver in ten years. In some of the older plants the "patio" process for reducing the ore, invented in 1557 and used for almost four centuries, is giving way to a new method more efficient and less costly.

While gold, silver, copper, lead, tin and zinc exist in untold quantities throughout some parts of Mexico, mountains of almost solid iron rise up in the ranges to offer a more rugged, but equally rich treasure to industry. And beautiful onyx, opal deposits, turquoise, and even mercury, add an array of precious material in the rock-ribbed vaults and veins that traverse the hidden depths of the land of waiting

wealth. Over this realm of treasure lie wide expanses of fertile soils, affording to the grower and breeder the means of extracting the richness of agricultural products in the shape of grains, sugar, beans, tobacco and coffee, and green and storage feed for thousands of herds of cattle, horses and sheep.

In five large oil fields which rank among the world's greatest petroleum districts, science and engineering to disclose a world of wealth that centuries ago tempted and lured seekers from overseas. And, though they swarmed across the continent gleaning treasure from the more accessible places, it remained for modern skill and enterprise to reveal to the world an unequaled storehouse of riches lying beneath rugged hills and rolling plains where barbaric tribes were once content with

Though Frequently Surrounded by Battling Forces during Periods of Civil Discord, Many Industrial Towns of Mexico Refused to Arrest Commercial Activities or Halt Development of Enterprises

are veritable forests of needlelike derricks representing a combined flow that often reaches 1,500,000 barrels daily. Pipe lines and tanks built on the most up-to-date plans help to hold and carry this liquid wealth to seaport and railroad, where it is poured into waiting carriers for transport overseas and into the commercial and factory centers of North and South America.

Although internal disorder and unfortunate strife have arrested industry and halted development for long periods in the past, the steady trend of outside money and men toward the untapped riches of Mexico has aided in the opening up of new fields of commerce and trade. On the east coast near the oil fields, seaports are daily crowded with tank ships carrying a "stream" of liquid gold from the greatest basin of petroleum ever discovered within the history of man.

Cities have grown from villages and hamlets and towns have sprung overnight on what was a short time ago but barren plain, now ripped open by the tools of meager livelihoods wrung with crude implements from roughly cultivated fields.

Saxophone Key Pad Held by Button Saves Time and Improves Tone

To save time in replacing saxophone key pads and to insure uninterrupted flow of tones, a button that "snaps" the cloth disk in place and prevents it from bulging into the air passage, is being manufactured. The fastener is so constructed that it holds the pad flat at all times and can be removed with a penknife in a moment. By eliminating the necessity of cement or glue, it is claimed the arrangement avoids accidental displacement of the key wads while the instrument is being played. Since the player can renew the covering without other aid, it is said the expense of shipping the piece to a repair shop is done away with, and that the method causes the pads to last longer than when the ordinary fastening process is used.

Bamboo Reeds Play When Shaken by Java Musician

Like many other oriental races, the Javanese are highly artistic and find expression in music which is peculiar to their own

Natives with the Anklung, a Bamboo Instrument Which Plays a Gay Melody When Shaken by Hand

island. The gamelan is a sort of native orchestra, composed chiefly of gongs sounded in various cadences so as to produce a very complicated but sweet melody, with an accompaniment of wind and string instruments. Simpler music is produced from a bamboo instrument called the anklung. This is shaken by hand and gives forth a gay rhythm of which the natives are very fond. The music is played in the open air and is frequently the accompaniment to entertainments at which the age-old stories of the island are told. The people of Java are well known for their beautiful work in copper and gold, although, having none of their own, they have to import their raw materials. Batik work, now so popular in America, is made by the natives also by simply weaving the cloth in narrow stripes.

Sun Worshipers Still Powerful, Cling to Strange Rites

Although acting as bankers for much of India and controlling a large portion of the natural resources of the country, and in spite of the fact that they have accepted the teachings of modern science, the sun worshipers still hold to their ancient form of religion. Members of the sect have established great cotton mills in the city of Bombay and hired American engineers to develop water power and other natural resources. Originally natives of Persia, they were driven out by the Arabs in the eighth century. According to recent figures, the sun worshipers now number only 101,778 of India's 319 millions.

Auto Radiator Fan Is Reversible to Keep Motor Warm or Cool

To prevent freezing in winter, as well as overheating in summer, a reversible radiator fan for automobiles has been patented that can be changed in a second to meet weather needs. During low temperatures it can be made to keep out cold air and to blow a powerful warm current over the radiator. In hot months it acts like an ordinary fan, sucking the air through the radiator.

Heart Tester Helps in Liquor Hunt among Travelers' Luggage

With the aid of a stethoscope, used by physicians to detect disorders of the human heart, the chief of police of a Minnesota city tests incoming and outgoing baggage for traces of gurgles that might reveal the presence of contraband liquors. With the receiving tubes adjusted to his ears and the sensitive diaphragm of the instrument placed on the suspicious suit-

Police Official Using a Physician's Stethoscope in Search for Liquor

case or bag, the official, by shaking the article, can detect quickly any sounds that might warrant a further investigation.

Sifting "Cure Dust" from Truck Hopper, One Man Can Treat Long Stretch of Road

Better Roads, Less Cost, Is Claim for Concrete-Curing Process

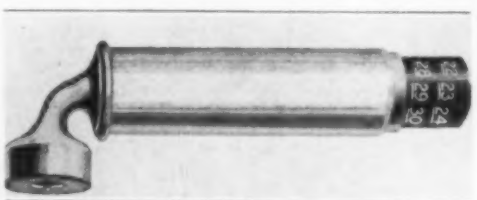
To save labor and speed up the work, a method of concrete curing has been invented. The chemical preparation used is a light dust substance and is applied by sifting it from a hopper on the rear of a truck on which a supply of the material is carried. It absorbs moisture from the air and prevents drying out of the cement. One man can treat a long stretch of road in one day. One or two treatments with the material each season are said to be effective in laying the dust by binding together the particles that may have accumulated on gravel or macadamized roads.

Sewing Machines Use Sixty Million Feet of Lumber Every Year

How large savings in lumber can be effected by careful milling and the use of standard parts in manufacturing is shown in reports of a company that annually requires 35,000,000 feet of hardwood timber for making sewing machine cabinets, an industry that still requires each year 60,000,000 feet of lumber, almost enough to fill a solid train of cars thirty-two miles long. Parts of the cabinets have been so well standardized by this company that it is able to cut much of its material from edgings, slabs, short pieces and knotty boards not readily marketable in long lengths as graded lumber.

Balloon Tire Gauge Tells Pressure in One-Pound Graduations

For the proper inflation of so-called balloon tires, an air gauge that registers low pressures in one-pound graduations has been placed on the market. It insures having the exact amount of air, a requirement much more important with these tires than with others. The gauge has an angle foot which makes its use possible with disk wheels, and those with wire or thick spokes, or large brake drums.



Air-Pressure Gauge with One-Pound Graduations for Accurate Tests on Balloon Tires

Automatic Teacher Makes Study Easy for Young Pupils

To overcome diffidence, develop self-confidence and to make possible the acquisition of a fund of knowledge in geography, history, picture study and civics without demanding an unreasonable increase in vocabulary, an automatic, card-flashing machine has been invented. The facts to be presented are printed in large type on a series of cards which are placed in the machine. A spring motor drops them, one at a time, before the eyes of the pupils. This assures the presentation of one fact at a time upon which the children concentrate. The mechanical action is a challenge to each pupil to call the cards before they drop, thus developing alertness. Constant repetition results in self-confidence. The machine may be used with a class under the supervision of a teacher, or in a corner with a single backward pupil.

Pupils Reading Lessons on Cards Flashed by Mechanical Teacher, and Close-Up of Apparatus Ready for Classes

Artistic Finish Left on Concrete by Liquid Applied to Forms

By applying a patented liquid to the inside of wooden or metal forms used in concrete construction, a rough surface can be given finished cement without added treatment. The substance is put on with an ordinary paint brush before the cement is poured into the form. When the boards are taken off, the outside "skin-coat" of cement is left as a fine powder which is brushed away, exposing the rough surface beneath. The material is not affected by rain or snow and, as it hides the form marks and scratches, rough lumber can be used in place of more expensive matched boards and old forms can be used repeatedly, thus effecting a considerable saving in building costs. The liquid is especially valuable in decorative concrete work.

Warship Funnel Serves as Garage after Being Scrapped by Navy

Forming a convenient garage with space enough for two cars, a funnel from the scrapped battleship "Maine" has been put to practical use by a Philadelphia man. It was "salvaged" from the government navy yard and only a few alterations had to be made to fit it for service.

Copyright, Keystone View Co.

Philadelphia Man and Garage He Made from Funnel of Battleship "Maine"

Million Lamps Are Used in City's Ten Thousand Electric Signs

More than 1,000,000 incandescent lamps burn in the 10,000 electric signs that New York City merchants have erected in front of their stores and shops. Practically every class of tradesmen is represented, but restaurant keepers head the list with 2,130 signs. Tobacconists are next with 809. Theaters and movies use 447, and eighteen undertakers employ electric lights to advertise their services.

Folding Bungalow for Auto Trips Fits on Running Board

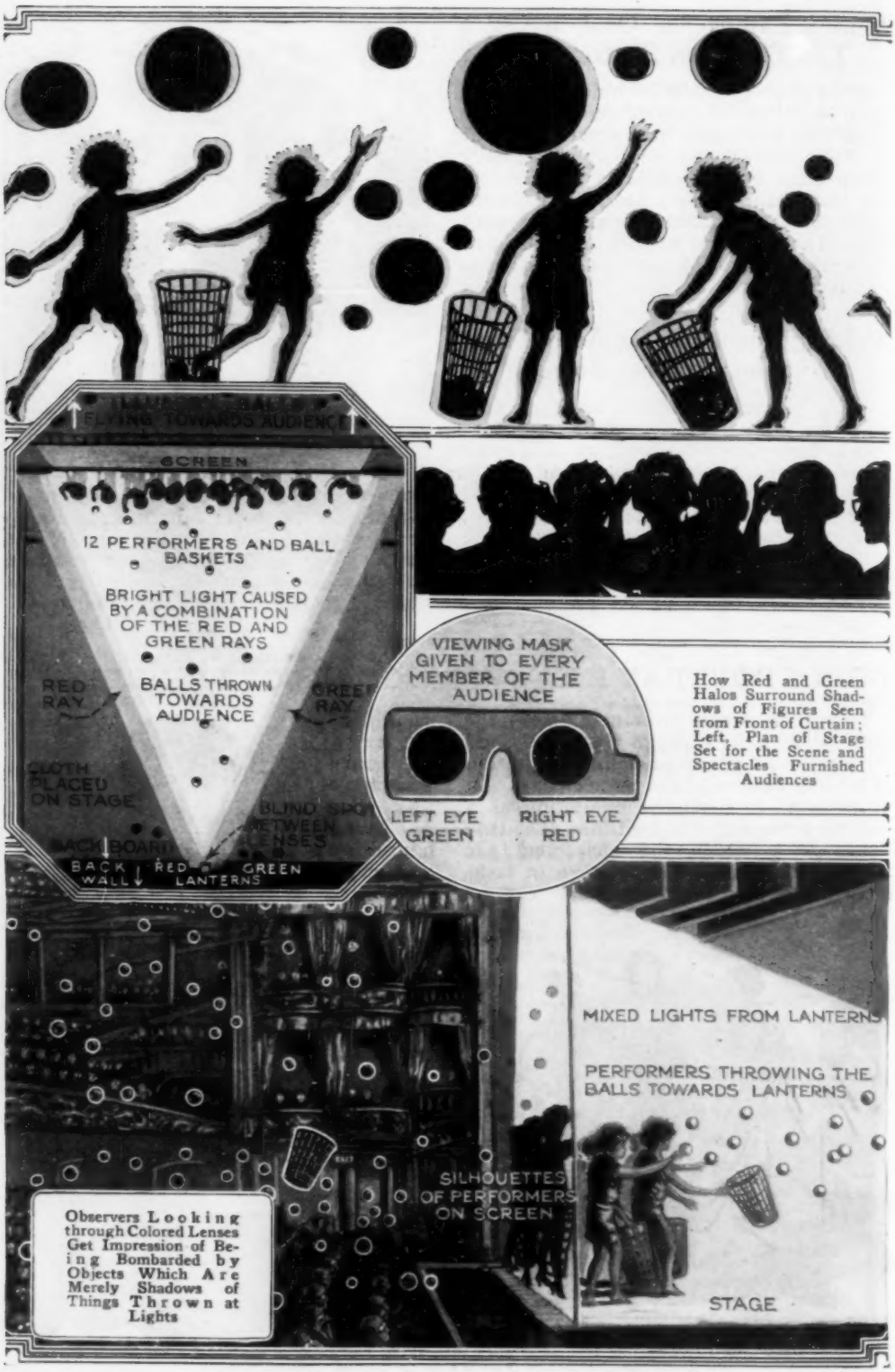
Many of the comforts of home are provided for automobile tourists by a roomy canvas bungalow that folds up in a small trunk on the running board and has a table, double bed, benches that can be used for children's beds or seats for six persons, cupboard and other conveniences. The tent is hung over a collapsible steel frame and requires no stakes or stay ropes. It can be taken down or set up in a few moments. Eight large windows, netted and fitted with storm flaps, afford ventilation and protection from the weather and can be raised or lowered from the inside. Curtains are provided for dividing the sleeping quarters into private rooms.

Family Dining in Folding Bungalow and Auto Trunk That Carries It on Journey

DOLLS PORTRAY HISTORIC FIGURES OF PIONEER AGE

To portray people prominent among the early settlers, the Chicago Historical Society modeled a group of dolls in imitation of leading figures of the pioneer days. It is intended to keep the exhibition as a historic reminder of those times. The costumes with which the characters are clothed represent the styles then in fashion. Each figure of the group can be identified with its original by names appearing with the display. Most of the figures are of women in early civic work.

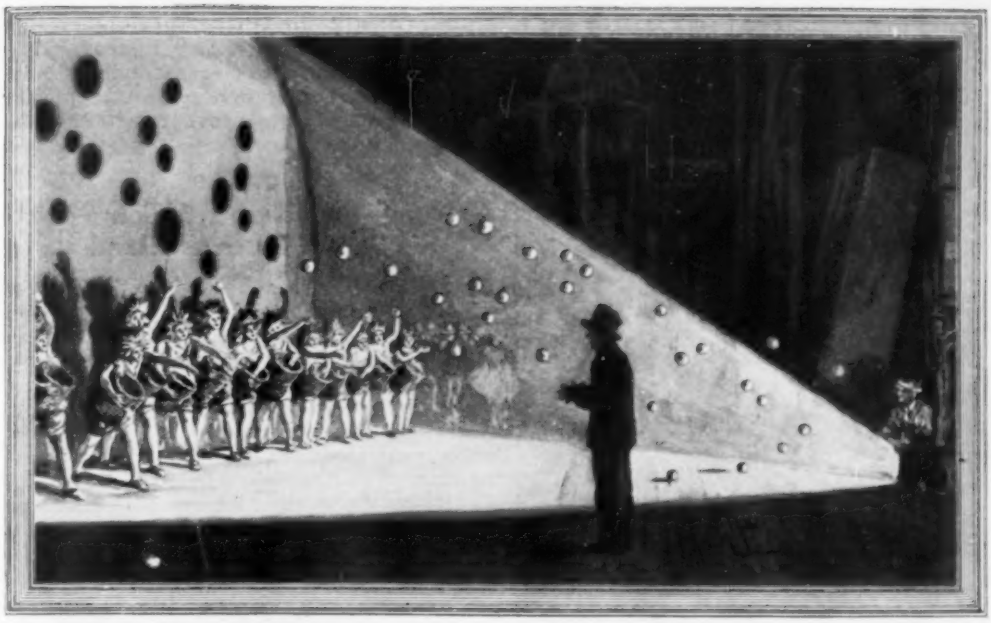
Group of Dolls That Represent the Pioneer Women Who Were Prominent in the Early Civic Work Carried On in the Community from Which the City of Chicago Grew



How Red and Green Halos Surround Shadows of Figures Seen from Front of Curtain; Left, Plan of Stage Set for the Scene and Spectacles Furnished Audiences

Observers Looking through Colored Lenses Get Impression of Being Bombarded by Objects Which Are Merely Shadows of Things Thrown at Lights

Courtesy, Illustrated London News



Courtesy, Illustrated London News

Behind the Screen on Which Shadows of Balls Thrown toward Spotlights Are Made to Appear as Solid Objects Flying at the Audience When Seen through Special Spectacles

Screen Shadows Given Life and Color

Realism Is Lent to Blurred Figures by Viewing Them through Colored Glasses on a Silvered Screen

BLURRED shadows on a silvered screen are given a lifelike realism—form, height, length and depth—by spectacles with a green lens for the left eye and a red one for the right.

Viewed with the naked eyes, the figures and objects appear only as indistinct blurs surrounded by reddish-green halos, but they are brought out in startling relief when seen through the lenses.

Although the exact method has been kept a closely guarded secret, it has been applied to the stage, movies and to printing. When used in the theater, every member of the audience is given a "viewing mask," or spectacles, equipped with the colored lenses.

Then a screen is lowered between the actors and spectators, the figures of the former being thrown against it by the rays from two spotlights equipped with red and green lenses, which direct the beams at such an angle that the solid shadows seem to be surrounded by colored halos.

Figures on the stage dancing toward the lights increase rapidly in size on the silver sheet. A ball actually thrown away from the audience appears to grow larger until it seems to be floating directly toward the spectator. On the other hand, figures advancing toward the audience grow smaller on the screen and appear to be moving in an opposite direction.

Even greater realism is gained by applying the system to the movies, where a man thrusting out a fist seems about to hit the spectator in the face and an involuntary gasp of alarm and a ducking of heads are caused by a dog that appears about to leap out of the screen into the laps of the audience. In printing, pictures appear in their natural colors and besides the usual dimensions of length and breadth also appear to have depth—three dimensions against the usual two.

¶Congress has authorized the minting of 5,000,000 fifty-cent pieces to commemorate the beginning of work on the Confederate memorial on Stone Mountain, Ga. The coins will be sold at one dollar each and the proceeds used for the undertaking.

"Totem" Carved in Dead Tree Recalls Indian Lore

Elaborately carved with weird figures and designs, a "totem tree" is one of the oddities to be seen near Auburn, N. Y. Carving the tree proved a unique way of preserving it for further usefulness after it had died. The strange figures attract much attention from automobile tourists. The tops of the branches were cut off and means employed to prevent further decay of the trunk.

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"Totem" Carved from Dead Tree That Recalls Indian Lore to Tourists in New York

Map That Inspired Columbus Shows Earth as Island

Christopher Columbus' map, believed to be the one that inspired his epoch-making voyage, was recently found in the National Library in Paris. An illustration accompanying it gives a view of the port of Genoa and on it, in writing identical to known autographic notes by the explorer, are notations relative to the spherical shape of the earth. The map shows the earth as it was then known, an island surrounded by four oceans. It gives in detail the coast lines of Europe and of Africa as far south as the Cape of Good Hope.

Braying Birds Are Found in Cruise through Andes in Steamer

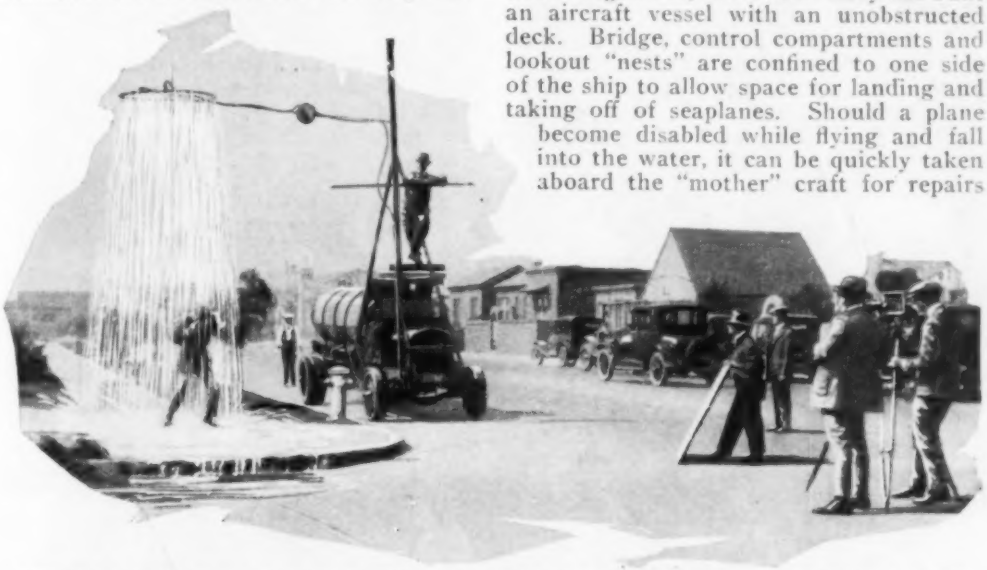
Birds that bray like a jackass and live in trees in company with parrots, humming birds and woodpeckers were found by members of an expedition that cruised in a steamer among islands off the Chilean coast, which in reality are submerged peaks of the Andean chain. Usually associated with the bleak antarctic wastes, the birds—penguins—surprised members of the expedition when they came upon them on an island covered with thick forests in which the trees were overgrown with ferns. A landscape artist equipped with a color camera was with the party and brought back specimens of the landscape pickled in formaldehyde. An interesting case of evolution was found in the steamer duck. One group gets its living without flying and has lost the use of its wings, while an inland branch of the same family is able to fly perfectly.

Milk from Kerosene Is Prediction

Predictions that milk may be made from kerosene were made before a joint convention of the Illinois Gas, Electric and Railway associations. All that is necessary, it was declared, is to eliminate the oil odor and extract the fat. Then, by adding water, which forms eighty-eight per cent of the content of milk, minerals and sugar, a nutritive substitute for the genuine product may be prepared.

Movies Make Rain While Sun Shines with Street-Sprinkler Tank

Realistic rainstorms are provided for motion-picture companies in Los Angeles whenever the directors need them by motor-driven street sprinklers owned by the city. Water is sprayed from an overhead attachment connected to a hose and force pump on the tank. Light and heavy showers can be produced and the "storm" is made to follow the actor by driving the truck alongside as he walks. Several sprinklers with various attachments are used for making heavy storms.



"Shooting" Motion-Picture Storm in Sunshine While Directors Boss the Rain, Pumped from Prosaic Street Sprinkler That Pursues the Actor as He Receives Drenching before Cameras

Mirror Lens on Tail Lamps Guards Auto if Light Is Out

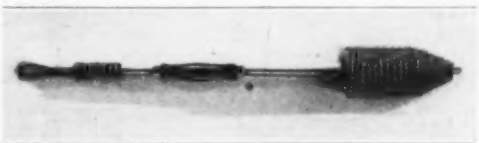
With pyramid-shaped prisms on its inside surface, a lens for the automobile tail signal has been invented to give greater brilliancy to the light and to afford protection for the car even if the lamps should go out. The prisms are so designed that light from approaching cars illuminates them a bright red at a distance of 250 feet or more. The lens is inserted with the flat surface out and fits any standard lamp.

One-Sided Ship Is Landing Field for Aircraft at Sea

To provide hangars, repair shops and a "landing field" for airplanes when maneuvering at sea, the British navy has built an aircraft vessel with an unobstructed deck. Bridge, control compartments and lookout "nests" are confined to one side of the ship to allow space for landing and taking off of seaplanes. Should a plane become disabled while flying and fall into the water, it can be quickly taken aboard the "mother" craft for repairs and safety. The deck is constructed with a wide beam to afford as much room as possible for fliers when preparing to launch.

Brush with Three Sets of Bristles Cleans All Parts of Typewriter

For giving the typewriter a thorough cleaning, a brush with three sets of bristles has been devised. It will reach behind the platen and in other difficult places. A rotary section is adapted to scouring the type and longer bristles are provided for a general dusting. The brush also can be used for other office appliances, is easily handled by a center grip and is strongly constructed.



Three Brushes in One for Cleaning All Parts of Typewriter; Grip in Center

¶Chinese peaches weighing a pound are raised in Shantung.

Cooling the Palates of Millions

Train Thousand Miles Long Would Be Required to Transport Materials Used in One Year's Production of Ice Cream

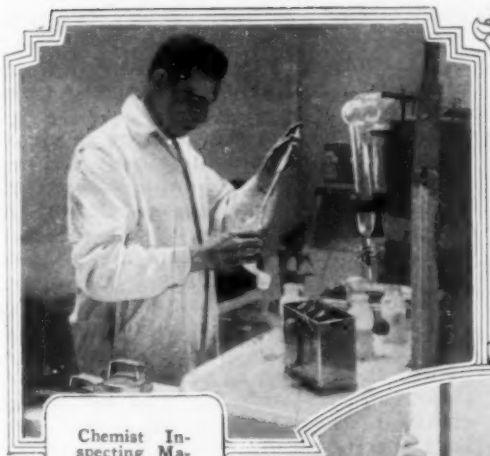
NOT so many years ago ice cream, the nation's most popular frozen confection, was looked upon as only a sort of luxury. Today it is recognized as a wholesome and nutritious food. Last year the factory production of the frigid dainty sweet mass. Their work is to break down the most minute globules of cream fat, assuring a rich, smooth and easily digestible solution. After flavoring is poured into it, the mix goes to a battery of freezers, the cylinders of which are of German silver and spin at great speed. Six gallons of mixture will usually make about ten gallons of ice cream. Every twelve minutes, a hundred quarts of the product are made in each freezer. Formerly freezing was done in ordinary air, but now the carbonating process is largely employed, which means that the cream is frozen in an atmosphere of carbon dioxide to keep it free from impurities and to avoid the millions of almost invisible dust particles that float in the air. When freezing is completed, the ice cream is packed in various-sized cans and placed in a large hardening room where a zero temperature is maintained.

Where Ice-Cream Cone Is Popular Refreshment, and Section of Laboratory in a Freezing Plant

reached a total of 300,000,000 gallons—almost three gallons for every person in the United States. And in addition, a volume not as large is annually made in the homes with small hand-turned freezers.

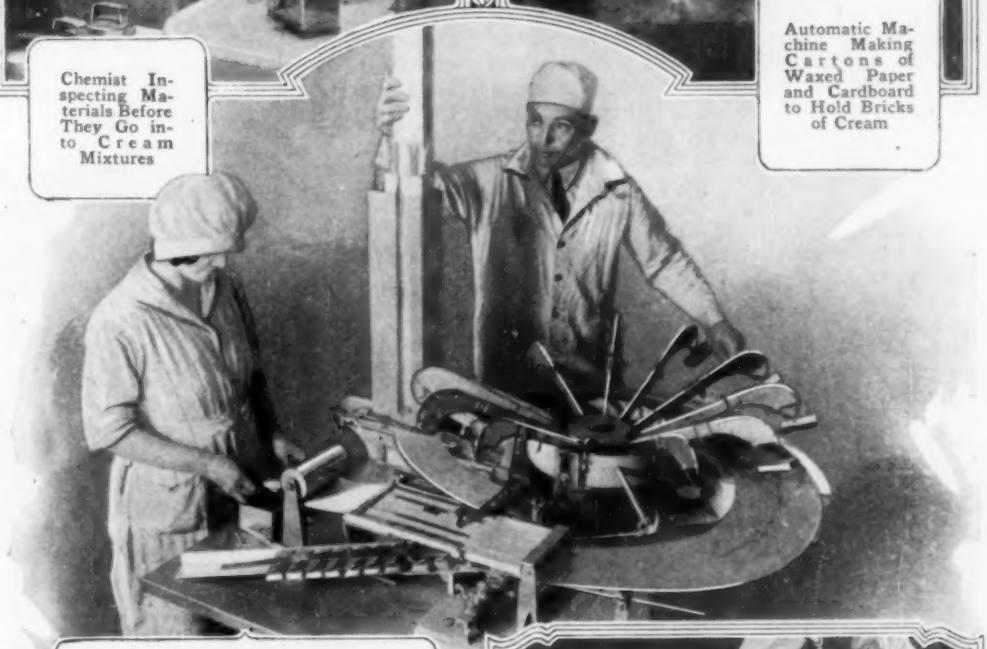
The machinery in the plants where ice cream is made is entirely automatic, and the product is not touched by human hands at any stage of its manufacture. Although the milk and cream used are pasteurized before leaving the creameries, as an extra precaution the materials are treated again when they arrive at the factory. Glass-lined tanks with a capacity of 1,200 gallons an hour each are used for the purpose. While this process is going on, sugar is added to the liquid and the "mix," as it is known, is then pumped into machines called "viscolizers," which exert a pressure of from 2,500 to 3,000 pounds a square inch on the

Special machines used for packing brick ice cream have three-compartment hoppers at the top, so that blocks composed of three different-flavored layers can be molded. Cartons for these are fed onto

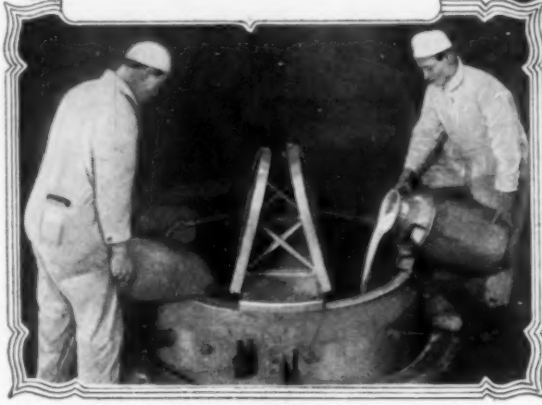


Chemist Inspecting Materials Before They Go into Cream Mixtures

Automatic Machine Making Cartons of Waxed Paper and Cardboard to Hold Bricks of Cream



Mechanical Dipper That Coats Blocks of Ice Cream with Chocolate and Incloses Them in Tinfoil without Aid of Human Hands



Left, Mixing Fresh Cream and Sugar in Vats for Pasteurizing, and Above, Bricking Machine Where Quart Cubes of Ice Cream Are Molded Directly into Their Containers

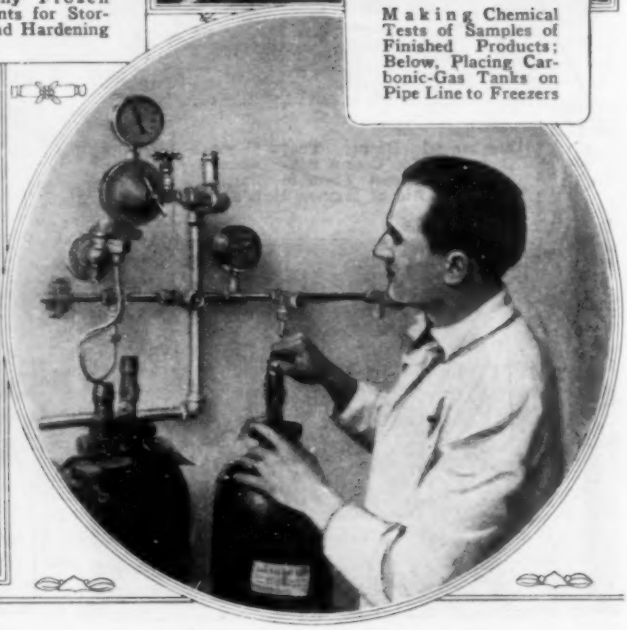
a revolving carrier directly below the hopper, and as it passes the opening, a spring-released valve permits a quantity of each kind of cream to flow into the container. The wrappers are then closed and tied, the parcels are laid in pans and carried to the hardening room, where a temperature of about five degrees below zero "sets" the bricks. Each bricking machine has an output of approximately 1,400 blocks an hour. Many tempting frozen novelties such as individual sundaes, neatly put up in waxed containers, that hold about a fourth of a pint of ice cream, and centered with chocolate or fruit flavors, are also made with mechanical mixers. The machines used for these are similar to the bricking apparatus but smaller, and the cartons are filled at the rate of seventy-two a minute. After lying in the hardening room for three or four hours, the molded ice-cream shapes are "stuffed" with crushed fruits or some other confection.

Another popular tidbit manufactured in the plants is the small cube of ice cream coated with chocolate. In making these, slices are cut from regular-size bricks and placed on a dipping rack, which is then immersed for a short period in a tank of milk chocolate that has been first heated to a liquid state. As the frigid cream comes in contact with the fluid chocolate the latter hardens and forms a thin brittle shell around the tiny blocks. When removed from its supporting pin, the coated bar is wrapped in paper and tinfoil and placed in the hardening room to become more solid.

Every large ice-cream factory maintains a complete and modern scientific laboratory, where each ingredient is subjected to a careful inspection before entering the process of manufacture. In this department the finished products are all analyzed and tested for quality. Daily tests are also made to determine the amounts of milk fats, sugar, non-fat solids and other materials contained in the frozen dainties, before the supply is permitted to enter shipment. So wide has the use of ice cream become that many states have laws specifying the volume of butter fat the manufactured article must contain.

Making Chemical Tests of Samples of Finished Products; Below, Placing Carbonic-Gas Tanks on Pipe Line to Freezers

Draining Ice-Cream Freezer of Partially Frozen Contents for Storage and Hardening

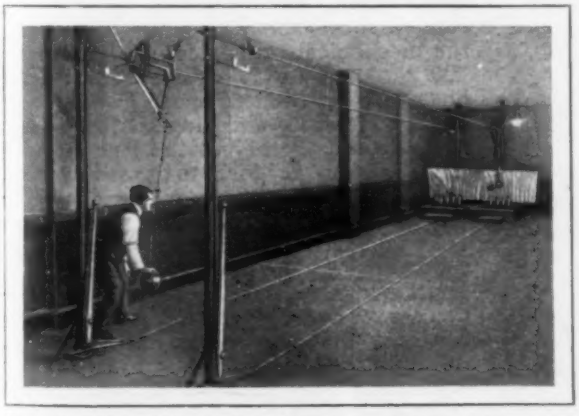


Way to Save Fading Masterpieces from Destruction Is Sought

Attempts to discover methods or treatments whereby oil paintings may be preserved from fading and cracking are being made at Harvard university. It is estimated that paintings of modern artists will not last more than fifty years, due to the action of light and air on the oils in the pigments used. Some have shown signs of fading and crumbling after fifteen or twenty years. Experts have found that air, light and moisture get in their disastrous work behind the canvas as well as in front. To avert this, a sheet metal background with many short sharp points on the surface for holding the canvas has been tried with some success, and varnish has long been applied. Expansion and contraction under changes in temperature often crack the coating, however, leaving the pigment exposed. So far, experts declare, no absolutely certain protective process has been discovered.

Bowling Alley with Balls on Wire Is Operated by Player

Bowling is given a new "twist" in a one-man alley recently invented. The ball, suspended on a spring trolley arrangement, is sent through the air and aimed to hit the pins well up toward the top. Pulling a lever puts the pins back in position and returns the sphere to the player. Score is kept in the usual way and the ball, similar to that used in the ordinary game, is held with three fingers in regular position.



Preparing for "Trolley Shot"; Levers near Player Return Ball and Set up Pins

With this apparatus, one man can play a practice game and operate the alley, thus saving the expense of pin setters.

Scaling of Fish Becomes Easy Task with Clamp Holder

Much of the difficulty of scaling fish is removed by putting them in a wire holder which prevents their slipping out. The head is imprisoned between two curved pieces of metal and the tail is firmly fixed in a clamp. When one side has been scraped, the fish is turned over easily by means of a swivel joint. There is a wooden base which may be used as a chopping block. The device is light and durable and takes up but little room in the camping equipment.

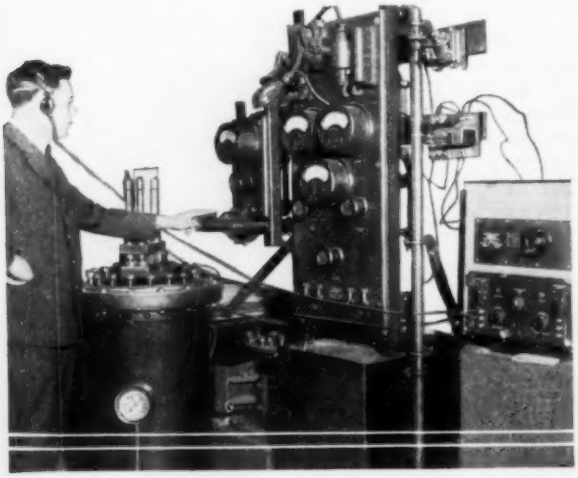
Big or Little Fish Are Scraped Easily when Held in Strong Spring Clamp

Liquid Covering Dries on Floors

Liquid floor covering, said to dispense with the trouble and expense of cutting and laying sheet material in awkwardly shaped rooms, is the invention of a European housing expert. The composition consists of cork, linseed oil, gum, resin and ocher, or any such coloring as may be desired. In a room that is artificially heated, the flooring will dry in about thirty-six hours. The substance is said to fit itself to uneven floors, and worn-out places can be cut out and refilled.

Crash of Ships in Fog Prevented by Use of Sound Waves

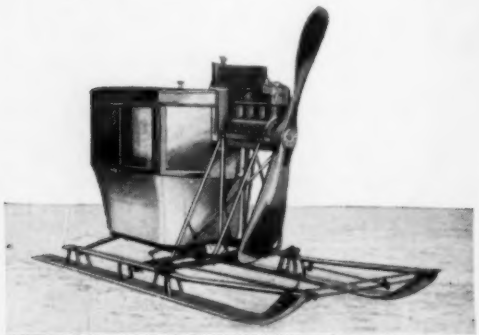
To protect vessels from collisions in heavy fogs and grounding in shallow waters, a depth finder developed by the navy throws out sound waves that reflect back to it when they strike bottom. A recording meter shows the distance the sounds travel, thus enabling the craft to avoid hidden shoals and mud banks. By registering the nearness of other ships, the detector, it is believed, will greatly aid in reducing collisions as it will give ample warning of the presence of other ships near by.



Submarine Detector That Sends Out Sound Waves to Show Distance of Hidden Obstacles

Motor Sled Driven by Propeller over Snow, Land or Water

Steered by a flexible steel rib under its single set of runners, a propeller-driven motor sleigh has been patented. With but a slight twist of the wheel, the ribs are moved sufficiently to change the course of the machine which can make a complete turn within a 60-foot radius. It weighs about 400 pounds, carries two persons in a small tonneau and can be fitted with pontoons or wheels for use on water or land.



Motor Sled with Inclosed Body That Can Be Used over Snow, Land or Water

Peat Fields Turned into Profit

Peat is being prepared for almost instant use at low cost in Germany by feeding it into the cylindric molds of a hydraulic press which forms the material into large dry cakes. These are ready to burn after only a few hours of drying in the open air. As peat contains originally ninety per cent water and loses by means of the new system not more than twenty-five per cent of its moisture, a maximum efficiency is insured at minimum expense. A further reduction of the amount of water, it is said, would serve only to increase very considerably the cost of the product without improving the quality. The quickness in the drying achieved is one of the most important features of the new system.

Laws of Mechanics Aid Pole Vaulter in "Lofting" the Bar

In a series of remarkable photographs of Dean Brownell, champion pole vaulter, taken during exhibitions of his skill, the camera shows the application of many of the mechanical principles involved in the law of leverage. To raise the athlete's body to clear the bar, speed in approaching the standards and judgment in placing the pole preparatory to the leap upward, give the necessary force to assist in accomplishing the leverlike movement. While the jump occupies but a few seconds, the lens adapted to register clear pictures when confronted by rapid motion, caught the performer in several different positions of the feat. Heights greater than thirteen feet have been cleared by the athlete by skillfully timing his speed and by the adjustment of the vaulting pole to his weight and force of motion.

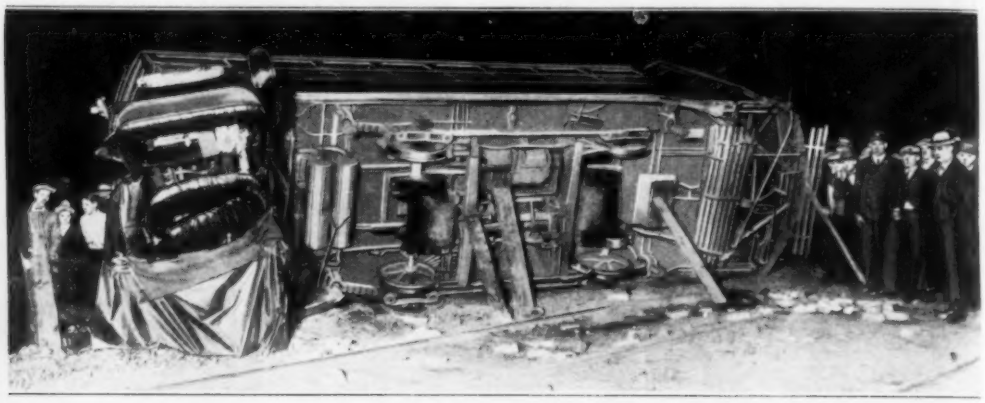
¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by addressing our Bureau of Information.

Photos Copyright, Underwood & Underwood

Where Mechanics Serves the Athlete; Dean Brownell, University of Illinois Pole Vaulter, Raising Himself over Bar Twelve Feet above Ground, in Performance Involving Several Mechanical Laws

Street Car Is Overturned by Auto Which Is Wrecked in Crash

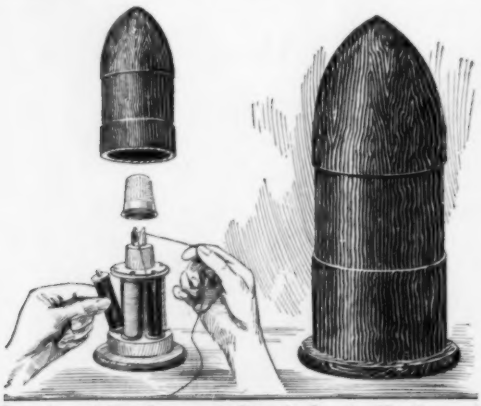
Impact from a speeding automobile was so strong that it overturned a street car of much greater weight when the two collided in a midwestern city. The full force of the automobile, which was telescoped in the crash, was expended directly upon the end of the car, lifting both trucks from the rails and tipping the coach over on its side.



What Happened When a Speeding Automobile and Street Car Collided at Dangerous Crossing

Turn of Dial on Pocket Sewing Kit Selects Proper Needle

Emergency sewing is simplified by a kit comprising five spools of thread, needles of assorted sizes, an aluminum thimble and a thread cutter. It is less than three inches long and about an inch thick, and can be carried in pocket or handbag. By turning a dial indicator on the base to the size required, the proper needle is ejected.



Drawing of Kit Open and Closed; Spools, Needles and Thread Fit in Base

Warning against Many Sham Furs Issued by London Dealers

Sham furs are said to have flooded the market in such quantities that London dealers have been forced to issue a statement giving the "incorrect and approved descriptions of furs" for the protection of the public. According to this report, women who are priding themselves on the possession of a beautiful blue fox, may be cherishing the fur of half a dozen rabbits. Cat skins, sheared and dyed, become seal, the statement reads. Rabbit fur is disguised as electric beaver, chinchilla, seal, black fox, sable, mink and squirrel; Tibet lamb becomes Iceland fox; dog takes on the appearance of skunk, fox or wolf; American opossum is turned into fitch, sable, skunk and stone marten; the kangaroo is disguised as fox, skunk, marten and sable and the hare becomes white fox, sable, seal, beaver and chinchilla. The dealers demand that fur be given its real name, and that, if it is prepared to resemble another fur, that fact be stated.

Opening of Tunnel Marks Epoch in History of New Zealand

Piercing a great range of mountains in New Zealand, the Otira railway tunnel, said to be the longest in the British empire, has been completed after seventeen years. Uniting two important provinces, it is more than five miles long and cost approximately $16,640,000. The tube will permit coal and gold from Westland to be transported to the other provinces by rail, thus eliminating a long and expensive water voyage. It also will aid farming and cattle-raising in the region, ushering in a new epoch of commercial prosperity.

Animal Life of Topsy-Turvy Land Links Past to Present

Like a vast prehistoric page from nature's wonder book, Australia holds great interest for the naturalist and traveler because of the peculiar animals found there, many of them being members of species that have long been extinct in Asia and America. Some of them afford connecting links by which scholars are able to trace animal life of the present back through the ages. Mammals that lay eggs, bears about the size of French poodles, opossums that fly, wolves striped like tigers and birds that laugh, are among the queer specimens found in this topsy-turvy land. One of the oddest animals in the world makes its home in Australia, the platypus, an amphibious creature which has fur, webbed feet and a bill like a duck. The lyre bird, a magnificent specimen that struts about like a golden pheasant or peacock and has a tail shaped like the musical instrument from which it is named, is another of the many interesting creatures native to the island continent.

Miss Vale with Actress Dolls Dressed as Real Players Appeared on Screen

Dolls for Grown-Ups Impersonate Characters Known to Stage

Dolls designed to impersonate well-known stage characters have appeared as novel additions to the world of make-believe. Facial expressions, costumes and coiffures are reproduced realistically and the bodies of the dolls are constructed of flexible materials so that arms and legs can be bent in a variety of postures. Miss Margaret Vale, niece of the late Woodrow Wilson, is said to have been the originator of the idea.

CHAIN REEL ON BELT PREVENTS LOSS OF KEYS

Keys are protected from loss and theft and are held in position for ready use by a small reel holder and chain designed for attaching to the belt. When wanted, the key is pulled out on the extension chain which, when released, is automatically wound up again, thus preventing it from becoming entangled or jerked loose. The holder is of special service to watchmen, postmen and policemen, is quickly put on the strap and cannot get lost as long as the belt is fastened. The device also guards the wearer against forgetting his key ring when changing clothing, and since it does not come in severe contact with the apparel, cannot cut the fabric with sharp edges.

BEAUTY AND UTILITY IN NEW PORCH FURNITURE

Double Use of the Sun Porch Is Gained with Folding Wicker Divan That Makes a Wide Bed at Night; Springs and Soft Cushions Add Comfort by Day

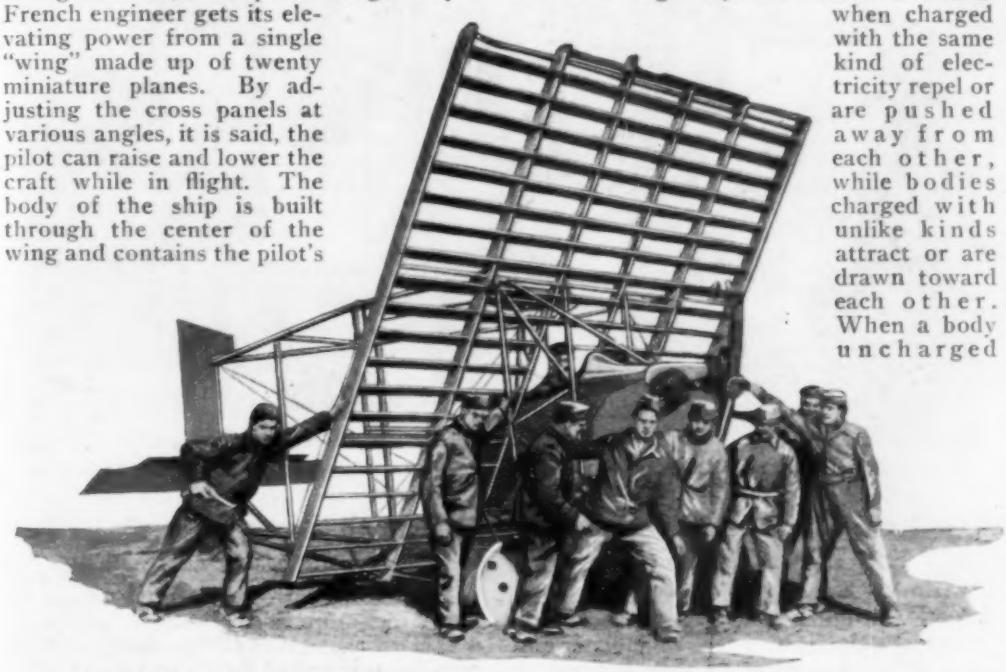
Wicker Table and Settees with Flat Upholstered Tops for Meals in Sunshine

Dignity and Rich Coloring Are Combined in Set with Floor Lamp for Evening, Practically Moving the Parlor Out to the Sun Porch

Cosy Chaise-Longue with Deep Cushions, and Extension That Can Be Used as Settee

Plane Wing Like Window Shutter May Be Adjusted in Flight

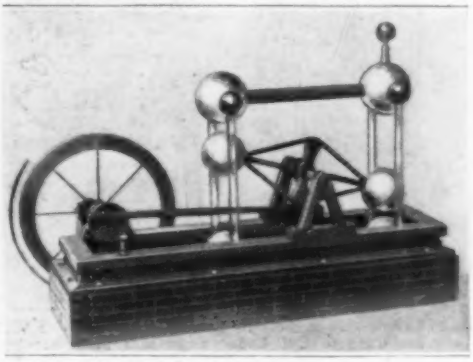
With a ladderlike arrangement of small lifting surfaces, an airplane designed by a French engineer gets its elevating power from a single "wing" made up of twenty miniature planes. By adjusting the cross panels at various angles, it is said, the pilot can raise and lower the craft while in flight. The body of the ship is built through the center of the wing and contains the pilot's seat and the propelling machinery. The conventional rudders at the tail end assist in balancing the craft.



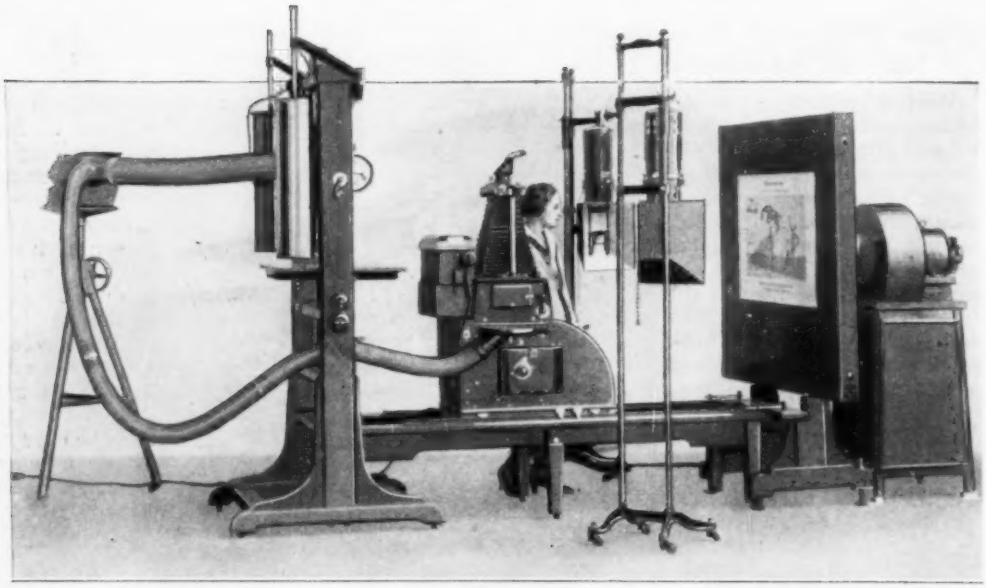
Airplane Which Gets Lifting Power from Twenty Small Planes That Form Single Ladderlike "Wing"

Static Electric Engine Is Shown in the National Museum

Ever since Dr. William Gilbert, physician to Queen Elizabeth of England, about 1600, used the word "electrics" in describing some of his experiments with amber, electricity has been a fascinating mystery. The presence and accumulation of static electricity is more or less of everyday observation, the most amazing demonstration, probably, being lightning, representing, as it does, an enormous accumulation of electrical energy in the heavens. To tap this source of energy, an inventor built an experimental static engine in 1876. This is now in the collection of the National Museum at Washington. The mechanical power developed is small for the reason that the mechanical force of static electric attraction and repulsion, which is the operating principle of the engine, is small. Whether the time will come when this form of energy and operating principle will have practical value, remains to be seen. One of the first things learned about electricity is that there are two kinds, positive and negative, and that two bodies when charged with the same kind of electricity repel or are pushed away from each other, while bodies charged with unlike kinds attract or are drawn toward each other. When a body uncharged with electricity is brought into proximity of a body charged with electricity, the uncharged body becomes charged. These truths are applied and caused to do work in the static engine illustrated. To operate the engine the upper balls are connected through a brass binding post to one pole of a static generator and the lower pair are linked with the opposite pole. The generator is only moderately excited.



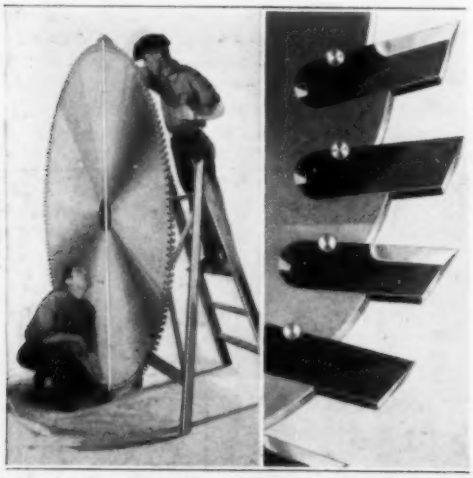
Static Electric Engine Built in 1876 and Shown in National Museum at Washington



Copying Camera That Takes 700 Pictures an Hour Directly onto a Sensitized Paper Reel Which Unrolls and Is Cut Up as It Is Exposed

Saw Runs Hundred Miles an Hour and Is Nine Feet Wide

Designed especially to cut the largest logs of the northwest, a circular saw has been made that is nine feet in diameter and runs at a speed of more than a hundred miles an hour. It was constructed from a steel ingot weighing 1,140 pounds, which was reheated, rolled and trimmed until the weight of the finished product was 795 pounds. The circumference is more than



Saw, Twenty-Eight Feet in Circumference, Which Will Be Used to Cut Cedar Logs into Shingles

twenty-eight feet. The teeth are inserted in the blade, a total of 190 being required.

Camera Photographs on Paper Reel It Cuts Up for Finishing

Photographing directly on a sensitized paper reel more than a hundred feet long, a camera that takes 700 pictures an hour has been invented in Germany to copy books and other printed or written matter. It is said the reproductions are absolute copies of the originals and can be made as small as a postage stamp without much loss of detail. As the roll is exposed behind the lens, the piece is cut off and drops into a case, or can be left intact and rewound for development. A holder is provided with a suction device that keeps it flat and smooth and eliminates clips and tacks that might mar the copy. Drawings and maps up to five feet square can be accommodated by the apparatus, and an elevating table is furnished to handle books, ledgers and other heavy subjects. It is claimed the machine can do the work of fifty people, in addition to insuring greater accuracy in recording the matter which is exposed to it.

Steel-Ball Stylus Rolls over Paper without Scratching or Tearing

Designed especially for train-order work and for copying, a durable stylus that will not scratch or tear the paper has been placed on the market. It has a double-balled "point" that rolls over the sheet with little friction, and can be used satisfactorily for making a number of copies.

Balloon to Pull Train up Mountain on One Anchored Rail

Balloon power is to be used on a unique railroad in Bavaria to haul cars to the summit of a mountain peak. The big bag, fastened to a small passenger car, is sixty-six feet in diameter and has a lifting power of 10,560 pounds. The car will run on a single T-shaped rail which is anchored to the ground. By allowing 3,300 pounds for passengers and crew and 4,620 pounds for the balloon, ropes and car, a margin of 2,640 pounds is left in favor of the gas-bag "engine" so that it will not be stalled on the upward climb. In descending, gravity is the only force required and water ballast provides the necessary extra weight to make the down grade.

City Has Free Elevator from Heights to Shopping Center

One of the oddest and most efficient transportation lines in the country is a hydraulic elevator maintained by Oregon City, Ore., to carry shoppers from their homes high on a bluff of the Willamette river to the town's business district on the banks below. The service is free. The shaft, snugly inclosed as protection against the weather, is 110 feet high and opens directly upon the main street. On top, it is only a few steps from the entrance of the

Here's How Oregon City, Ore., Has Solved a Traffic Problem—Shoppers' Special Elevator

lift to the sidewalk so that persons living near the edge of the cliff can "go down town" and back in a few moments.

Baby Seat between Bicycles Makes a Family Carryall

By fitting a comfortable seat on a frame between their bicycles, two English parents have provided a safe and easy

With this Three-Seated Tandem, the Whole Family Can Ride Comfortably on Pleasure Trips

place for their baby to ride. A strong strap is attached to the back of the chair and passed around the child's waist to keep it from falling out. The jar of the bicycles is taken up in a hammock-like suspension on which the seat rests.

Summer and Winter Stamps Differ in Thickness of Glue

To prevent them from sticking together when placed in the pocket, "summer" and "winter" postage stamps are being supplied by the government. The difference lies in the coating, that used during cold weather being thin and not so hard as the "summer" variety or an "intermediate" grade for fall and spring. Applying these various kinds of glue is one of the most difficult and exacting processes in the manufacture of the stamps. Great care must be taken to spread them evenly. The large sheets are run under rollers upon which the glue drops from small vats. Even temperature must be maintained at all stages of the process to insure uniform spreading.

Washable Maps Accurately Record Daily Changes in Records

Washable maps with a smooth, waterproof finish are being used to keep up-to-the-minute records of such items as salesmen's calls, dealer locations, the whereabouts of agents, or any other current news on which a graphic record is wanted. It is possible to block out and mark off territories with the ink or water color, and then use crayons for the more rapidly changing details.

Cleaning Washable Map to Prepare Surface for New Series of Marks and Colorings

Tricks of Drug Smugglers Keeping Police of Nation Busy

Concealed in the heels of shoes and slippers or hidden in vials inserted in tubes of toothpaste, prohibited drugs were confiscated by the police in an Ohio city recently. Thousands of dollars' worth of such contraband "dope" is gathered annually by state and government agents throughout the country. Most of the material is of such poor quality that it is unfit for medical purposes and is destroyed. At one large station of the government narcotic division, about $7,000 worth of various smuggled drugs captured by inspectors was recently thrown into a furnace and burned.

Frozen Air Is Cause of Blue Sky in Theory of Scientist

Frozen nitrogen, enveloping the upper air in a stratum which may be 350° below zero, gives the sky its blue color, according to the theory of Dr. L. Vegard of Paris. The gas frost is in a loose state and is believed to be electrically charged. The atmosphere is shallower at the poles than it is at the equator and the particles, coming in closer proximity to the earth at those points, are believed to cause the aurora borealis and other sky disturbances visible in polar latitudes. This frozen "shell" of air is also thought to act as an envelope, keeping the earth's atmosphere from drifting off into space.

Curb Flood of Noise and Live Longer Says Health Expert

By eliminating unnecessary noises in the activities of great cities, the average length of life there would be prolonged about seven years, according to Dr. H. N. Bundesen, health commissioner of Chicago. It is said that the constant racket of harsh and unpleasant sounds is responsible for nervous disorders which decrease the life span of many persons. Special laws against needless "noise makers," it is thought, will do much toward benefiting health.

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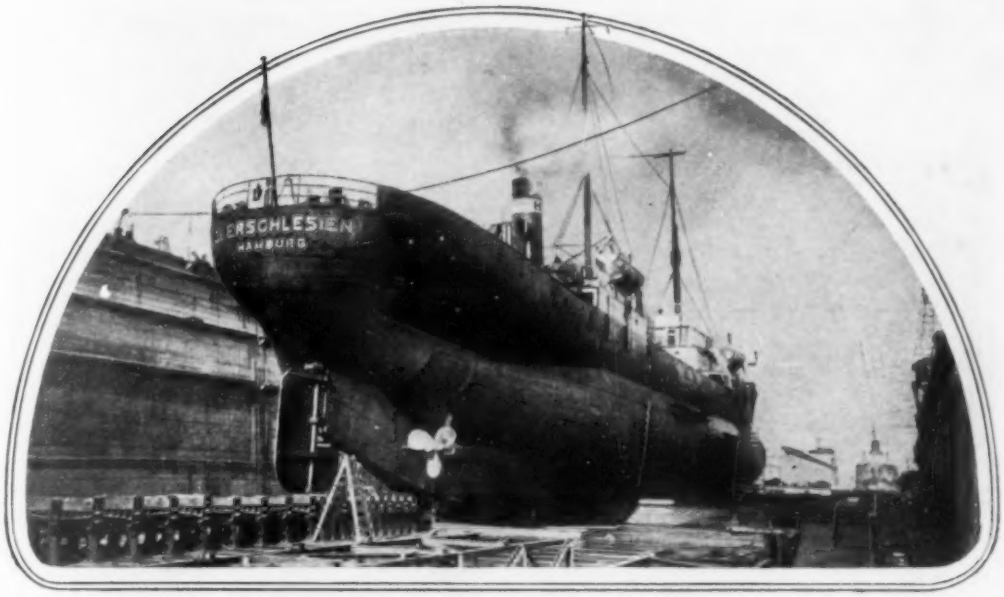
Government Narcotic Agent Feeding $7,000 Collection of "Outlaw" Drugs into a Refuse Furnace, and a Detective Dissecting Shoes That Conceal Valuable Parcels of Contraband Dope

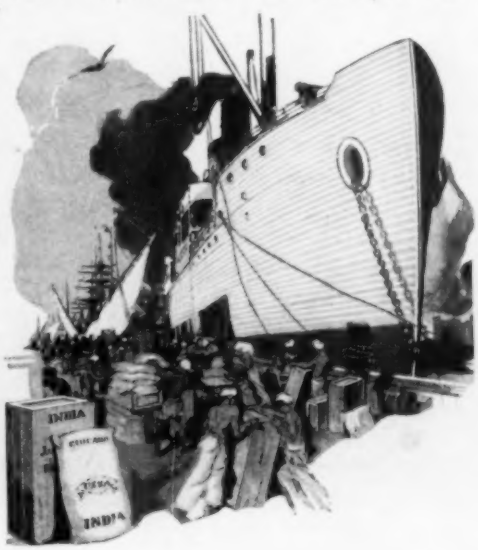


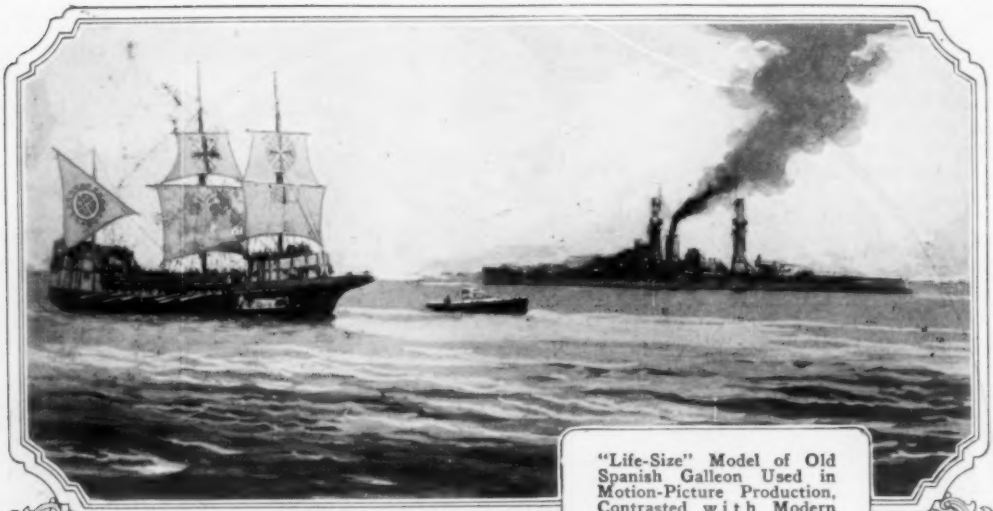
Built of Two Discarded Submarine Boats Riveted Together, This Strange German Craft Has Entered Sea Service as a Tanker and Is in Dock for Repairs and Cleaning

Square-Rigged Ships Passing from Seven Seas

Once Familiar Forest of Masts and Spars That Marked Day of "Windjammer" Disappearing from World's Ports

WITH the passing of the sailing ship from the trade lanes of the seven seas, the type of square-rigged craft that helped to make possible the extension of the outposts of civilization to arctic climes and carried intrepid adventurers into the heart of the western hemisphere, has ceased to be the familiar sights they once were in the seaports of the world. Leaving or entering busy harbors, they are now looked upon with awe and admiration by crews of curious seamen, few of whom know the thrill of flapping canvas wet with wind-flung rain gathered in the staggering troughs of tropical seas. Gliding as smoothly as a bird on the wing and rolling gracefully to the swell of the waves, they pass under envious eyes of begrimed coal heavers and tenders whose only school has been the stokehold or throbbing deck of a steamer. Once it was said that coal could not deprive the sailer of its place on the seas, because canvas-rigged freighters represented such a saving of fuel that they were assured of a lasting market for their services where imperishable cargoes were to be carried. But recent years have proved this untrue. The demand for goods carried in ships, and keen competition in reaching markets, have resulted in the development of de-

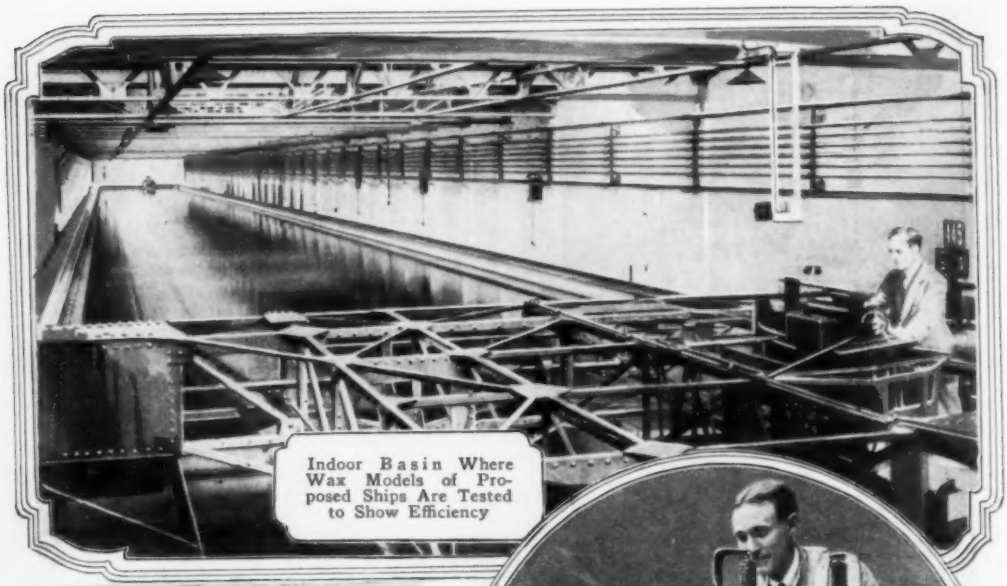




"Life-Size" Model of Old Spanish Galleon Used in Motion-Picture Production, Contrasted with Modern Battleship

Forest of Masts and Spars on a Fleet of Sailing Vessels, a Rare Sight in This Age of Steam and Electricity

Watercraft of Many Nations That Sailed the Seven Seas Long before the Age of Steam, and, in Center, Luxurious Smoking Room of Palatial Ocean Liner of the Present

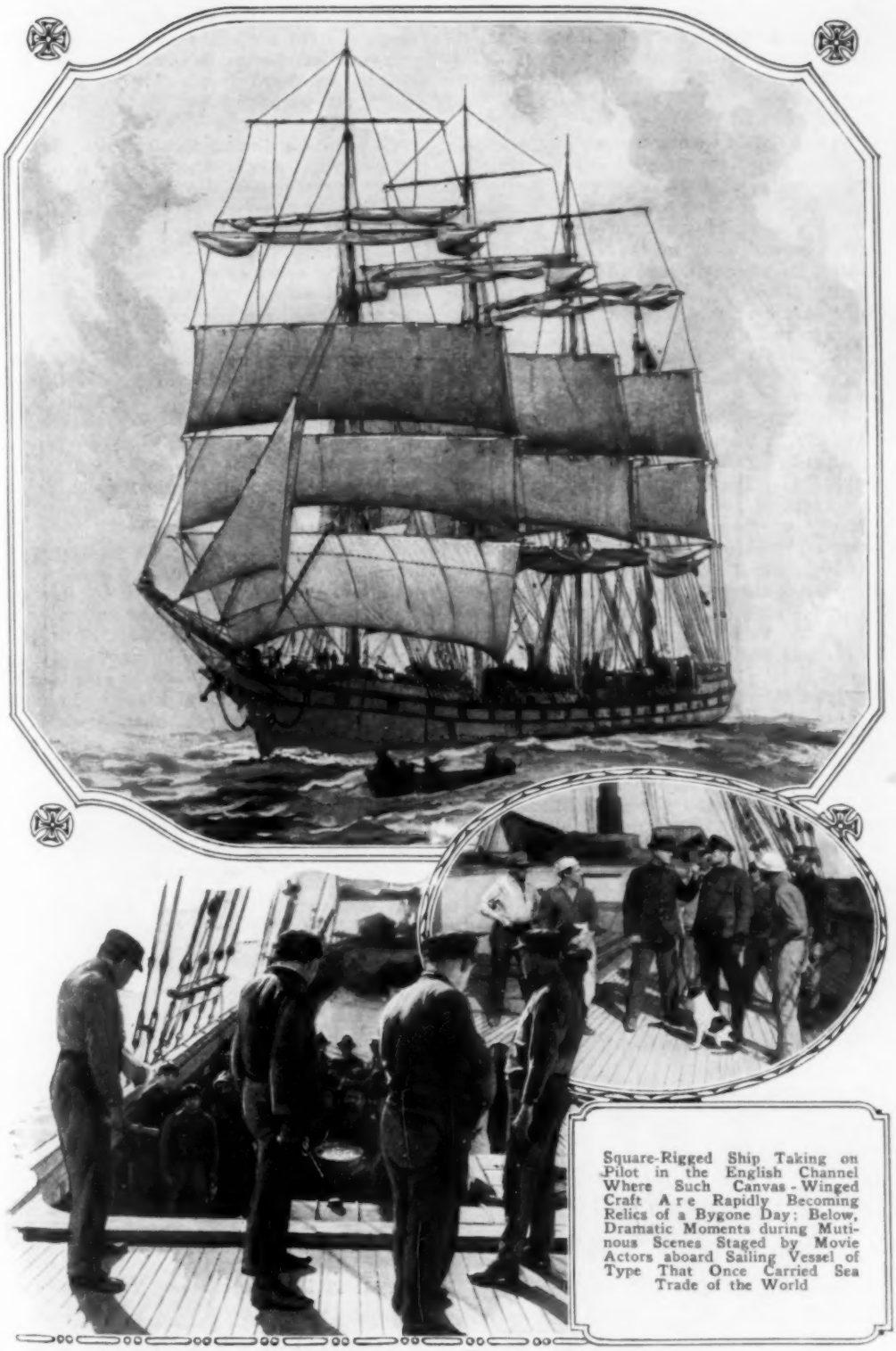


Indoor Basin Where Wax Models of Proposed Ships Are Tested to Show Efficiency

Force Needed to Move Vessel's Rudder Measured on Model Ship

At the Helm of Old-Time "Windjammer," Purchased by Motion-Picture Concern to Aid in Giving Romance and Color to Productions Dealing with Seafaring Folk

Huge Replica of Palatial Ocean Liner Built for Exhibition during a British National Trade Fair



Square-Rigged Ship Taking on Pilot in the English Channel Where Such Canvas-Winged Craft Are Rapidly Becoming Relics of a Bygone Day; Below, Dramatic Moments during Mutinous Scenes Staged by Movie Actors aboard Sailing Vessel of Type That Once Carried Sea Trade of the World

vices that reduce coal consumption, and the gain in speed over the slow sailer, always more or less at the mercy of the weather, more than balances any advantages cheaper crews and absence of fuel needs might have given the "old-timer."

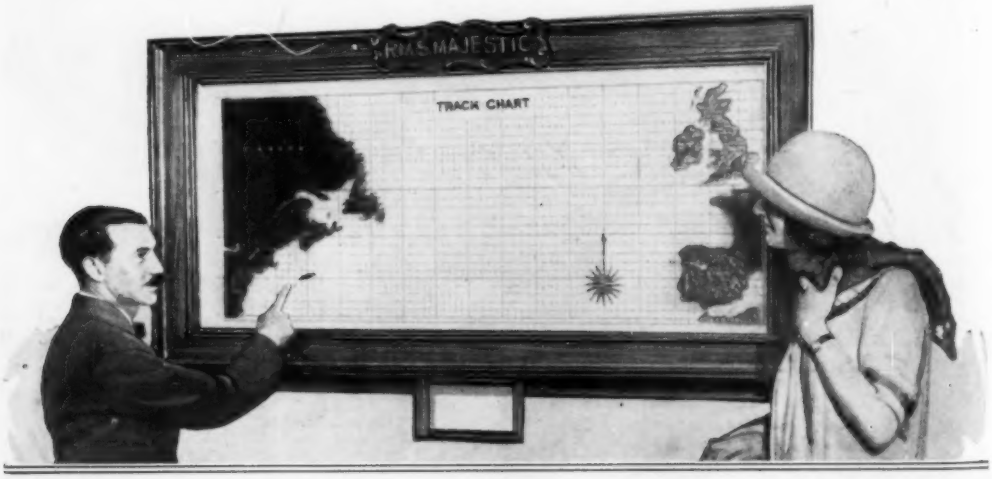
In the case of coastwise sailing schooners, this is not so true because of exceedingly small crews needed, for it is the big square-rigger that requires many hands to "work ship." However, even the smaller sailer seems doomed before the onward march of speedy motor ships, trim and sturdy affairs of light draft that call for only a few men to attend the humming engines and man the decks.

Nowhere is the passing of the square-rigger more manifest than along the shores near the great ports of the world. Not so long ago large fleets of canvased "packets," now rare, could be seen at certain times of the year fitting out for trips around the Horn or for hasty scampers into tropical and Asiatic seas. With the passing of these types also go the romantic "webfeet," as the sailors who busied themselves with the yards and strung out along the bowsprits, were called by seafaring folk. Many of these veterans might still be found spinning yarns of adventurous pasts with mates in the sailors' "snug harbors," where those too old for service or unable to get a berth aboard the steamships of this day find a place of rest and refuge, survivors of a romantic and glorious age of the sea.

Gone, too, are many of the rigging concerns which dotted the waterfronts frequented by the sailing craft. These were mostly composed of skilled sailors who had retired from active sea duty to give their service to fitting out vessels for voyages. There are still places where vessels can refit, but the old days when contracting riggers swarmed over a ship while she lay at her pier are gone, leaving here and there a chandlery where supplies and implements for the "windjammer" may still be purchased. Aside from rare occasions where speed is not of primary importance, few long voyages are given the full-rigger. With the coming of more realism in motion pictures, a place is frequently found where the services of such ships are required to afford colorful "locations" for the staging of sea scenes, and in many instances large screen-producing concerns have actually bought one or two boats outright in order to keep them among their properties for just such uses. Some of them have been towed from their "graveyards," hastily painted and fitted up for parts in plays of the sea and then, where the action of the piece demands it, deliberately sunk or wrecked to carry out the perfection of the production.

Few of the great figures who helped to make the era of the sailing vessel one of note and epic in the history of the sea remain, and those who have taken their places have gone into the field of steamships, where comfortable cabins, quick passages and less of the strain and watchfulness that marked the life of the mariner of the past, sharply contrast with the rugged calling that led the men of the old trader down to the seas in quest of livelihood and adventure.

But low-priced speed is fast abolishing the winged masts that once harnessed trade winds to sturdy hulls bearing the commerce of the seven seas.



Electric "Track" Chart of the Liner "Majestic" That Informs Voyagers of the Ship's Position

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Unique Photograph of Latest Army Bomber "Zooming" So Close to an Old-Fashioned Stage Coach That the Driver Ducked for Fear the Plane Would Touch

Monster Bomber Nearly "Scalps" Old-Fashioned Stage Coach

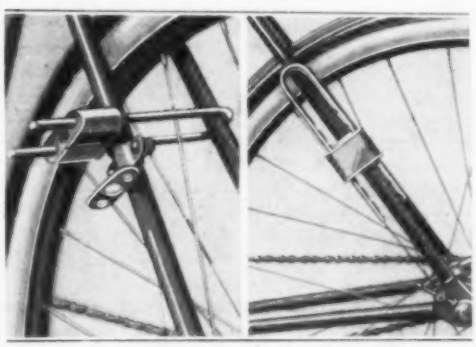
Progress achieved in the last half century was illustrated when a gigantic Martin bombing plane "zoomed" within a few feet of an old stage coach at Ormond Beach, Fla. With a lifting capacity of 5,000 pounds, the huge plane could have swung mules, coach and driver from the ground and carried them away. The aircraft has a record of 115 miles an hour.

Drama of the Diamond Mines Rivals the Romances of Fiction

Romance as strange as any that may be found in the pages of fiction surrounds the finding of famous South African diamonds. A brilliant flash of light in the eyes of an overseer was responsible for the discovery of the Cullinan stone, an event that thrilled the world several years ago. He dug out the stone with a pocketknife. It weighed 3,024 carats and was four inches long and two and a half inches wide. With only an hour left of the contract of a syndicate of London merchants, the famous Excelsior diamond was found by a Kaffir boy who was rewarded by a present of a hundred pounds and a horse and cart in exchange for a diamond which, in its rough state, was valued at a million pounds. While war and famine rioted over the Kimberley mine twenty-two years ago, the Kaffirs placidly continued their quest for precious stones. One of these natives came upon an irregular pebble which, even in the "blue earth,"—the diamond-bearing clay of Kimberley—shone brightly. On the scales the stone touched 221 carats, more than either the historic Regent or the Orloff.

Bicycle Thefts Are Balked by Lock Carried on the Frame

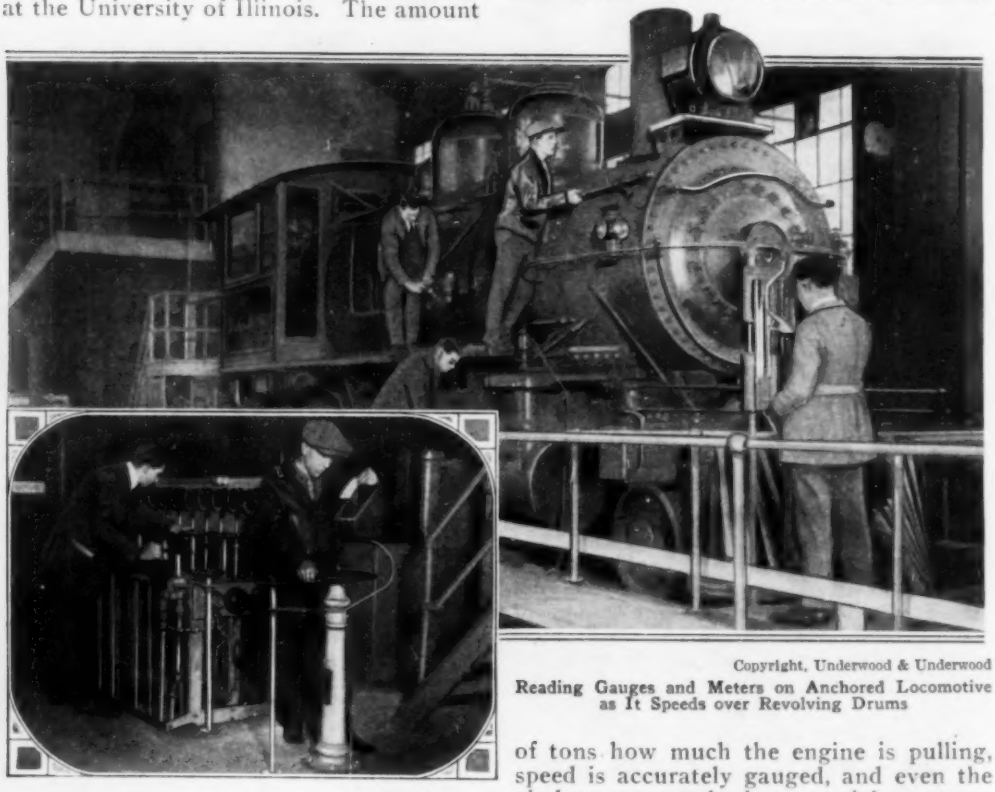
By means of a patented lock and holder, bicycle owners are protected against theft. The device consists of a two-pronged, notched shackle which is slipped between the rear spokes and inserted in a lock bolted to the rear frame. Unfastened, the shackle is slipped out of the lock and into two holes in the bracket where it is safe against being lost or stolen. The holder keeps the lock from scratching the enamel and does not jar loose.



Bicycle Shackle Locked and Fastened in Bracket Carrier Bolted to Side of Frame

RUNS FORTY MILES AN HOUR WITHOUT MOVING

Railroad locomotives, removed from the rails and mounted on rotating drums that revolve as the engine drive wheels turn, are tested accurately for speed, power, and other performances in a special laboratory at the University of Illinois. The amount of "pull" exerted can be regulated by increasing the friction between the engine drivers and the drums which are expanded by water pressure. Thus the "load" can be varied at will during the experiments. Water, coal, and oil consumed in the tests are carefully weighed and measured, dials and special instruments show in thousands of tons how much the engine is pulling, speed is accurately gauged, and even the cinders are caught in a special conveyor and weighed at the end of a "run" to test the performance of the grates and the burning qualities of the coal.



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Reading Gauges and Meters on Anchored Locomotive as It Speeds over Revolving Drums

Canary in Forty Mine Disasters Helps to Save Many Lives

Mary Jane is one of Uncle Sam's smallest employes. She is a tawny canary and has a record of having gone with forty mine-rescue parties into shafts where men were entombed by explosions. The bureau of mines employs several canaries, but Mary Jane is the veteran of the service. The canaries are used to give warning of gas poisoning as they are more sensitive than human beings. While a man might breathe gas-poisoned air for two or three hours, a canary will be overcome by it in a few minutes. Every rescue party going into a mine where gases are likely to be encountered, therefore, takes along a canary. When the bird begins to droop, the rescuers know they are running into gas.

Miniature Camera in Range Finder Is Aid to Photographers

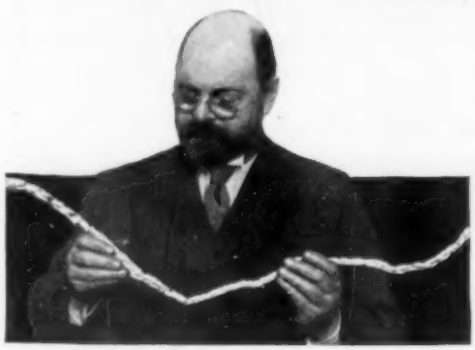
Showing at a glance whether the object to be photographed will appear sharp on the negative, a distance meter has been invented to aid photographers. The attachment is somewhat like a camera itself and consists of a lens which throws a part of the image to be taken upon a mirror and shaded glass. When the object appears sharp on the screen, the exposure can be made with assurance that focus is perfect.

Mine-Shaft House Is Dynamited When New One Is Ready

By blasting down an old mine-shaft house and rolling a new steel structure in its place, an ore company saved considerable time and expense through skillful engineering and the judicious use of explosives. Hoisting in the shaft was not interrupted while the steel house was being erected on skids, fifty feet from the wooden structure, and while piers were being installed. Then charges of explosive, timed to go off in "rotation," were placed under the legs of the old house on the side the engineers wanted it to fall and a steel cable was attached on the same side, to help pull it down. When the shots were fired, the old structure fell in the position desired and without damaging the new house. The debris was cleared away quickly, the steel building anchored, and in a few days hoisting was again in progress.

Petrified Lightning Found in Sand Is Exhibited by Museum

Petrified lightning is frequently found among the sand dunes at the southern end of Lake Michigan and in other places where large areas of sand lie exposed in regions visited by electric storms. The "fossils" are in reality ropes of melted silica which the intense heat generated by the bolt has transformed into glassy, tube-like strands extending several feet downward in a sand bank. Under the direction of Dr. D. H. Nichols, of the Field Museum



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Dr. D. H. Nichols of the Field Museum of Natural History Holding a Lightning "Fossil"

in Chicago, some of the "fossils" are being exhibited. The length of these lightning "freaks" is not known, as they break off before they can be dug out in their entirety. They are generally traced down to a damp stratum of sand.

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Peruvian Indian Family Sailing on Lake Titicaca in Their "Balsa" or Straw Boat

Straw Boats Carry Ton of Freight but May Be Lifted by One Man

Straw boats, so light that one man can carry a large one and so buoyant that a small one will support a ton of freight, are used by the Peruvian Indians. The boats are constructed of large cables of barley straw, tightly bound and lashed together. They are reported to be almost unsinkable and will not easily capsize. Responding to nearly every motion of the water, they are said to have the disadvantage of making even a seasoned sailor seasick, but their safety is counted an important point in their favor, for the waters of Lake Titicaca, where many of them are used, are so cold that even a strong swimmer would likely soon perish in their depths.

¶Making of lamp shades is simplified by a wire covering tape now on the market. When wound around the frame, it offers a foundation to which the material is easily stitched.

Freighting Supplies over New Section of Highway with Caravan of Tractors

Reindeer Sleds Hauling Provisions to Inland Settlements over Narrow Trail Beaten across Fields of Ice and Snow

Dog Team Hauling Mail Sled along Permanent Trail That Leads Out of Nome, Alaska

Above, Dog Car on Alaskan Tramway, and Tractor Train with Road Materials on Richardson Highway; Below, Reindeer Sleds, One of the Chief Means of Transportation in Interior Alaska

Breaking Paths across Alaskan Wilds

Tractor Trains, Sleds and "Dog-Power" Railways Carry Needed Supplies across Ice Fields and Mountain Barriers

BRIDGING raging glacial streams swollen by summer thaws and cutting narrow trails over rugged mountainsides, are but few of the tasks that confront the pioneer highway builders of interior Alaska. Most of this wild expanse of land can only be reached by river boats during the short summer season or by dog sled in the winter, making shipment of needed timber and light steel work for culverts and trestles a difficult matter. But with even these drawbacks facing them each year, the crews commissioned with the blazing of roadways between the hidden settlements dotting rugged territory, have thrown a network of paths over the area by which communication can be maintained despite extreme winters and drenching spring thaws. From Valdez, a south coast port open all the year, the Richardson highway, one of the country's most important roads, extends to Circle on the upper Yukon river. In its length of 531 miles the roadway crosses the Coast Range through Thompson pass at an elevation of 2,750 feet, and passes over the main Rocky Mountain range at a height of 3,300 feet. Parts of the highway are suitable for automobile travel, while others, beset by natural barriers, can accommodate only bobsleds in winter and wagons in summer.

Farther inland, where patches of the territory appear to be at times a mere jumble of glaciers, canyons, swamps and wind-swept wastes, most of the trails must be replanned each year because of the damage resulting from severe winter weather and heavy thaws. Flagged trails, narrow

Reindeer Racing Team Ready for Starter's Signal, and an Indian Driver with His Prize "Steed"; Left, Lifting Live Reindeer Aboard Vessel, and a Choice Specimen of the Beast of Burden of the North

paths laid out across frozen lakes and wide marshes, are marked by tripods of sticks or poles bearing bits of cloth to prevent travelers from becoming lost in the absence of natural landmarks.

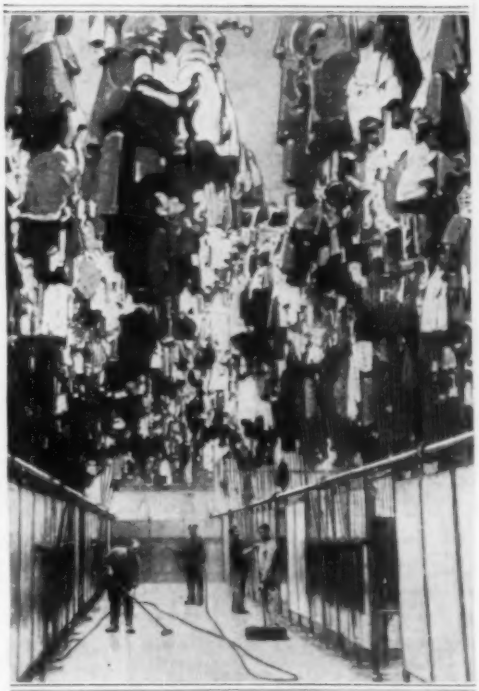
Together with about a dozen ferries, tram roads with cars drawn on tracks by dogs, and even overhead-cable trolleys are maintained to transport travelers and supplies to the almost inaccessible settlements. Many light cable suspension bridges have also been swung over deep gorges to give passage to pack trains and caravans of sleds pulled by reindeer, which are the chief means of transport in some sections. Work is always necessary along the dog trails because of the thick brush covering even the treeless plains and which grows rapidly during the warm season. In winter, although the frozen rivers might afford an attractive path for sled traffic, there is always danger of disaster on account of swift currents and hot springs that undermine the thickest ice. Wider surfacing is provided the wagon roads in the vicinity of principal towns and mining districts, and occasionally gravel is added to present a hard covering. With the constant improvement of the roads and trails, their condition continually becomes better from the repeated thawing and drying out each year. In all, the highway systems range from cableway and cage over glacial torrent to stakes across plains or frozen ocean inlets.

Clothes Hangers Raised to Roof by Chain to Stop Theft

When workers in a Holland mine don their overalls for the day's toil, they hang their street clothing on lock chains and pull them up to the roof of the dressing room out of reach of pickpockets, dust and water. Each man has a key to his own chain. When it is unlocked, hanger and suit descend. The arrangement was devised by one of the miners who sought protection from theft. The system simplifies the cleaning of the dressing room and saves the expense of lockers.

Split Leather Is Stronger than Grain According to Automotive Tests

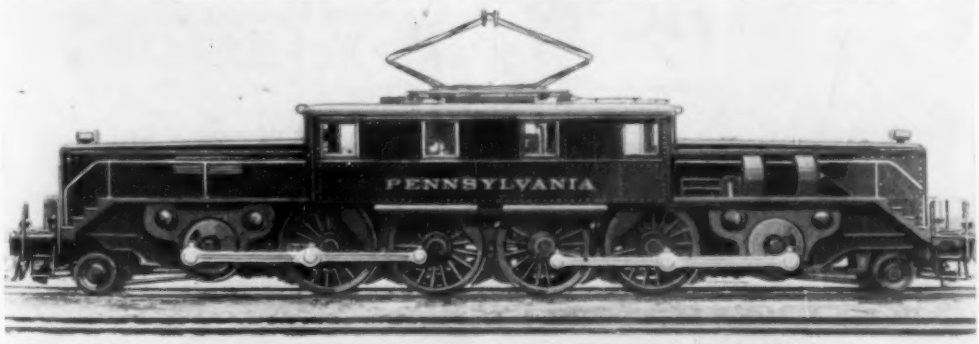
Tests which seem to disprove the theory that "splits" are inferior substitutes for grain leather have been conducted by several members of the Society of Automotive Engineers. Samples were placed in pulling machines such as are used in the textile industries. According to reports, the first split turned was several times stronger than the grain leather and the second and third were progressively stronger than the first.



"Bower" of Miners' Clothing Held Securely Overhead by Chains at Sides of Corridor

"TWO-IN-ONE" ELECTRIC ENGINE HAS GEAR SHIFT

By simply shifting the gears, the "L-5," a powerful electric locomotive now in use on the Pennsylvania railroad, can be adapted for hauling an express or passenger train at a speed of 46 miles an hour, or, thrown into "low," where it develops a starting tractive effort of 100,000 pounds, and will haul a heavy freight train at a 23-mile-an-hour clip. This "two-in-one" engine weighs 408,000 pounds and can be operated with direct or alternating current. It was assembled in a month's time, said to be a record for the Altoona shops of the railroad, and was exhibited in Philadelphia as the latest development in electric engines; those commonly used being geared for only one type of service, either freight or passenger.



Pennsylvania Railroad's Electric Locomotive, the "L-5," Equipped with Gear Shift to Haul Either Freight or Passenger Trains at a Moment's Notice without Shop Alterations

Coal Storage Pits where Fuel Is Half Submerged in Water to Prevent Spontaneous Combustion

Metal Flag Clamped to Track Rail Protects Yard Workers

Danger of accidents in railway yards is lessened by a mechanical flagman now in use. The device consists of a long steel clamp with a metal warning flag on top, and fixed firmly to the rail at the open end of the track on which an inspector is working, as a warning to switch crews shifting cars. At night a lantern is hung on a hookplaced in the center of the flag.

Mechanical Flagman, Clamped Firmly to Track, to Prevent Accidents in Railway Yards

Piles of Coal Stored under Water to Stop Fire Danger

To prevent waste by fires arising from spontaneous combustion, the Western Electric company of Chicago, stores its coal supply under water. Railroad cars containing the fuel shipments are run into the yards on tracks supported on piers between trenches of water ten feet deep. The piles are formed so they are nearly submerged at all times. As the tops of the heaps are constantly being removed for use, these parts are left exposed, and air circulation is sufficient to protect the coal during the time it is permitted to lie. The immersed portions are kept as long as two years before the fuel is lifted from the pits.

One-Man Machine for Plastering Does Work of Eight Craftsmen

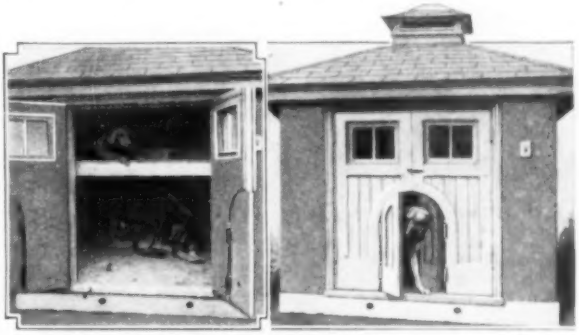
Experiments with a mechanical plasterer, which is said to enable one man to do the work of eight skilled craftsmen in one day, have been made in Detroit. According to reports a wall with several gables, 222 feet long and nine feet high, was covered with a three-eighths-inch veneer of ready-mixed mortar in two hours and thirty-five minutes. In an eight-hour day, one man, with the mechanical plasterer, applied 773 square yards of wet mortar as against eighty square yards, his normal performance when working with hand tools. Five laborers assisted him in supplying the materials and experts estimated that the job was equal to that ordinarily done by eight plasterers and six helpers.

Color of Diamonds Changed by Heat and Exposure to Radium

Is it possible to color diamonds successfully? This is the question to which an answer is being sought by chemists of the bureau of mines. For some time it has been known that changes in the hues of the brilliants may be effected by the action of heat or exposure to radium, but the colors obtained have not been entirely uniform. The present experiments, it is said, have proved that if straw-colored diamonds are completely covered with a ten-per-cent solution of chloride of radium, sealed in a glass tube and left for a few months, a deep sage-green color is produced, which seems to penetrate the whole crystal. Prolonged heating restores the original hue. While the value of the diamond is largely dependent upon its being free from color, stones of rose, blue or green tints are highly prized as gems, and therefore the perfection of any process to change the hue, it is believed, might have a more or less wide effect upon values.

Dogs' House Has Electric Comforts Rivaling the Modern Home

Rivaling modern bungalows in comfortable equipment, a dog house built by a Milwaukee man is electrically warmed and lighted. The structure consists of two stories, the upper one being sleeping quarters for the canine occupants. Heat and lights are turned on automatically as an animal enters the doorway and when it ascends to the top room, the lamps are turned off in the same way.



Left, Interior of Dog Bungalow Showing Upstairs Sleeping Quarters; Right, Swinging Doors That Control Heat and Light

Clothespin Bag Hung on Line Tilts and Contents Cannot Spill

To save reaching and fumbling for clothespins when hanging washed fabrics up to dry, a bag that hooks on the line and swings at an angle has been invented. The holder is made of tough cloth which can be removed quickly for replacing or cleaning. Because it does not need to be tipped when selecting a pin and can be slid along the line, the worker can keep it convenient to the hands during the entire task. The container has a capacity of twelve dozen pins and the contents cannot spill out.

Tilted Clothespin Bag That Slides on Line and Is Always Convenient for Worker.

Third of World's Railways Built in Quarter of Century

Totaling approximately 750,000 miles, according to figures prepared by the National City Bank of New York, the world's railroads, if placed in a single line, would reach to the moon and back and encircle the globe nearly eleven times. This amount represents an increase of 250,000 miles since 1900. Nearly all of the mileage has been built in the last seventy-four years for, in 1850, the world boasted only 25,000 miles of lines, less than is owned now by a single great system in the United States. About thirty-five per cent of the railroads are under government ownership, it is estimated. Conditions of government control and operation vary in different countries, and in the United States, Great Britain and Spain practically all the lines are under private ownership.

Fads and Fashions Adopted by Brides

Korean Bridegroom in His Wedding Hat and Robe, with Monks Garbed to Officiate at Ceremony

Bright Moccasins and Bands of Beads Give Color to Wedding Costumes of American Indian Bride and Bridegroom

Norwegian Bridegroom Generally Wears the "Conventional Black," but His Bride Is Resplendent in Gay Dress and Crown of Elaborate Workmanship

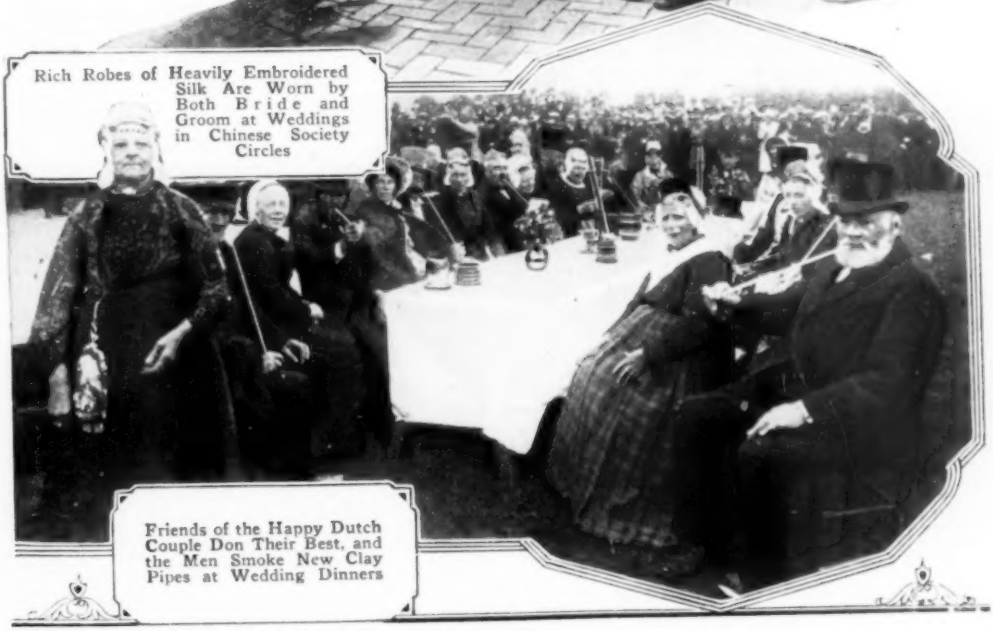
Greek Peasant Brides Wear Rich Lace Skirts and Brilliantly Colored Waists, Bedecked with Network of Gold Pieces

Photos Copyright, Underwood & Underwood

the World Over as Caught by Camera

Here Comes the Bulgarian Bride Decked Out in Her Wonderful Headdress of Roses and Other Flowers

East African Groom Delivering Goats to Prospective Father-in-Law to Pay for Hand of the Bride



Rich Robes of Heavily Embroidered Silk Are Worn by Both Bride and Groom at Weddings in Chinese Society Circles

Friends of the Happy Dutch Couple Don Their Best, and the Men Smoke New Clay Pipes at Wedding Dinners

Photos Copyright, Underwood & Underwood

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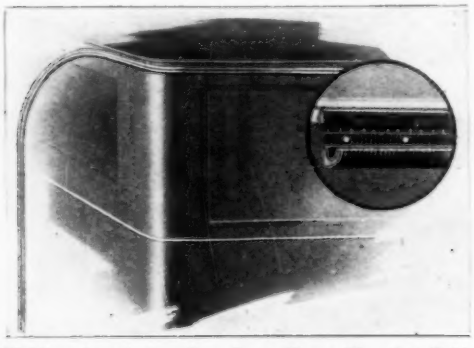
Giving Birds Displayed in Hot Spanish Market Shower Baths to Revive Them

Rubber Gutter on Auto Top Shields Car from Dripping Rain

Windows and the sides of closed automobiles are protected from rain running from the top by tacking a rubber trough just below the roof of the car. The gutter is covered with fabric leather or other material to match the top and the side is wide enough to fold down over the tacks, concealing them from view. The molding is flexible and durable, is not conspicuous, and can be attached with little difficulty.



Molding Attached to Car; Inset Shows Flap that Folds Over and Hides Tacks

Shower Baths Help to Revive Birds on Sale in Public Market

Exposed to the rays of the sun streaming into their cages while they are on display at a sidewalk market, birds, offered for sale by venders in Spain, frequently droop so that water must be poured over the cages to revive them. Refreshed by cooling streams from a watercan, the birds recover quickly.

Peat Tried as Plant Food to Cut the High Cost of Fertilizer

Large supplies of fertilizer can be obtained, according to the North Carolina geological and economic survey, from the peat bogs of that state and from similar deposits in other parts of the country. It is said that these peat deposits are one of the few domestic sources of nitrogen that can be economically applied to reclaiming exhausted farm lands.

¶Mounted on a small hinged support, a bar magnet for picking up phonograph needles has been invented.

Dynamite Deepens River Channel over Busy Subway Tubes

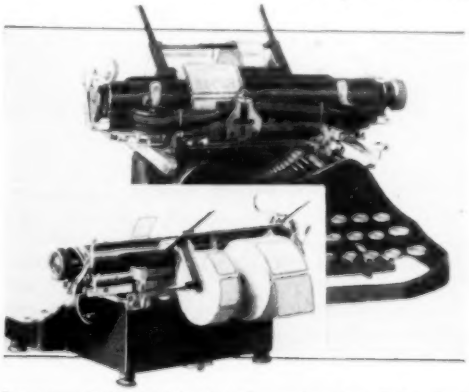
Blasting solid rock at the bottom of the East river, only thirty-five feet above the subway tubes connecting Manhattan with Brooklyn without interrupting the flow of traffic, was made possible by the use of dynamite and engineering skill. The charges were so carefully timed and placed that few passengers realized the work that was going on. Holes for the blasts were made from a drill boat. When the shots were touched off, the firer signaled to the shore and trains about to enter the tubes were held up momentarily.

Fog Alarms Run by Human Hair

Few people realize the extent to which human life is safeguarded by automatic devices. Among the latest of these is a fog-horn valve, controlled by a few strands of human hair. The hairs are stretched across a wooden frame, and the ends are fastened to a series of sensitive springs. When a fog comes up the hairs become moist and expand. This sets the horn in operation. After the fog is dissipated, the hairs contract and shut off the horn.

Typewriting Labels Is Made Easy by Roll Paper Holder

To facilitate the writing of labels, a holder has been made that is quickly attached or detached from the carriage. The paper is carried in a roll in a way somewhat similar to the method used with adding machines.



Ingenious Label Holder for Typewriter that Rides Back and Forth on the Carriage

Holder and labels can be left on the machine, if desired, without interfering with other work.

Hats for Wear in Next Century Are Displayed in Paris

Designed for wear in the spring of 2000 A. D., styles of millinery shown at a ball in Paris were composed of massive ar-

Headdress of Gorgeous Feathers Displayed as Millinery to Be Fashionable in 2000 A. D.

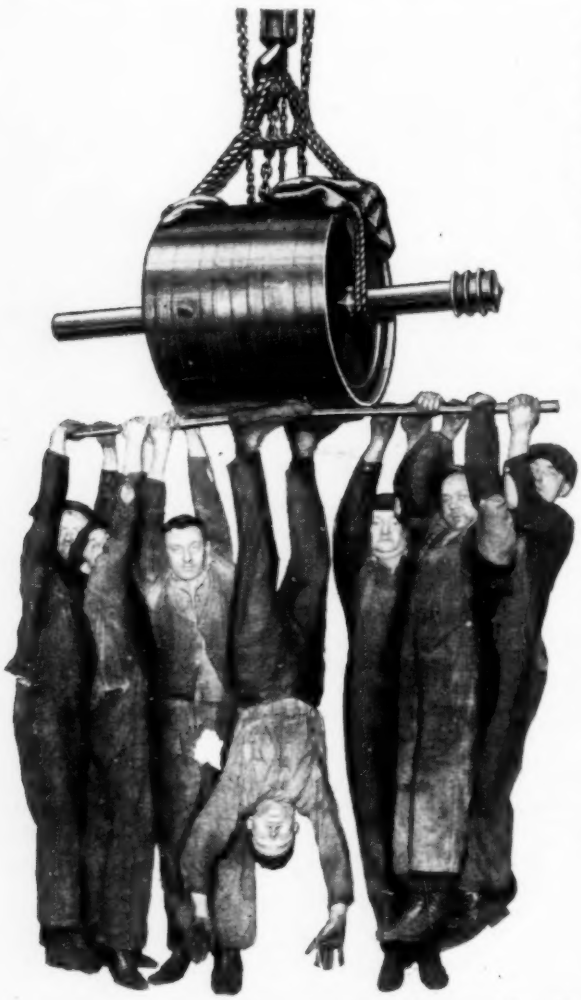
rangements of feathers and large clusters of leaves. One of the most popular models consisted of a decoration of gorgeous feathers that towered above the wearer's head and drooped gracefully to her shoulders. Gaudy headdresses of blossoms and foliage also were displayed as fashions that would be the mode during the first years of the next century.

"Oil Wells" in African Butter Tree Feed Lamps of Natives

Because carrying charges on kerosene almost prohibit its use among the peoples of interior Africa, oil drawn from the shea butter tree is employed as fuel and light by many of the natives. Growing in great numbers throughout some districts, this plant is said to produce a fluid rivaling that made in the petroleum refineries. The nut of the oil palm is also a source of supply for such liquids but both trees are reported to be so plentiful that wide cultivation of them is not necessary, although markets are found for practically the entire output of the oils.

Seven Men Are Lifted by Magnet, One Hanging Head Downward

To demonstrate the pulling power of an industrial type of electromagnet used for separating metallic substances from other materials, seven men, totaling 1,150 pounds in weight, were suspended from it and lifted clear of the ground. The magnet



Huge Magnet Lifting Six Men on Small Steel Bar and Seventh, Head Downward, Held by Metal Shoe Plates

was hoisted in a rope sling about eight feet from the floor and a metal bar was placed in contact with it. When a current of 220 volts was applied, six men grasped the bar and were lifted clear of the ground. A seventh man, into whose shoes had been placed thin metal plates, was hoisted up and held head downward.

Gold Seekers Are Tempted Again by "Last of Galleons"

Another effort to salvage what is believed to be the treasure-laden "Duke of Florence" that was sunk some 335 years ago off the coast of Scotland, is to be made by an English company. Other attempts have been made from time to time, never with complete success, but each yielded enough treasure to prove the wealth of the wreck and whet the ardor of succeeding generations of gold seekers. Divers have found the vessel imbedded in thirty feet of clay and silt. Part of the ship has been cleared with suction pipes. History records that the ship sailed into Tobermory bay shortly after the defeat of the Spanish Armada, sorely in need of food and water. Before departing, the captain was asked by a Scottish clan chieftain to contribute 100 armed men toward a raid on a neighboring clan. A quarrel arose as to how much the soldiers should receive for their services. The chief sent one of his men aboard the boat to set a fire train to its powder store. The explosion tore a great hole in the side of the vessel, which sank immediately with all of the 380 men aboard. Considerable doubt has been raised as to the identity of the ship, but contemporary documents bearing on the wreck and much of the treasure taken from it, seem to prove that it is in reality the rich and powerful "Duke of Florence" that ranked among the first five ships in importance in the Armada. Spanish records show that the daily expense of the fleet was about $222,000, the funds being carried in the ships.

Motor Horn That Imitates Human Voice

Operated by electricity, a motor horn that can be made to shout "Away! Away!" was demonstrated at a recent session of the Imperial College of Science in London, during an address on the artificial production of the human voice. By blowing into a contrivance modeled on the human larynx, the speaker also gave an imitation of a man singing "For He's a Jolly Good Fellow," and a cockney newsboy shouting "Papers."

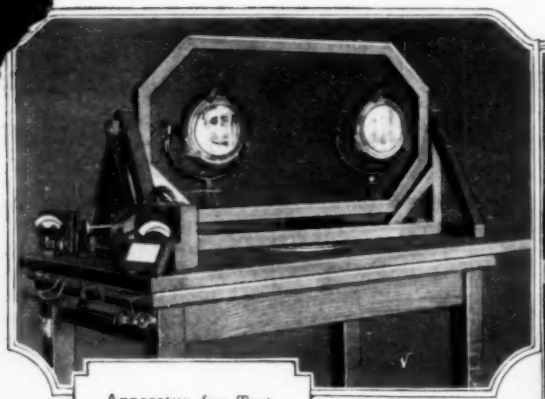
How Uncle Sam Is Savin[illegible] Millions for Autoists, Home[illegible] Owners and Industries

Touring Car Fitted with Apparatus That Shows Resistance of Road and Air

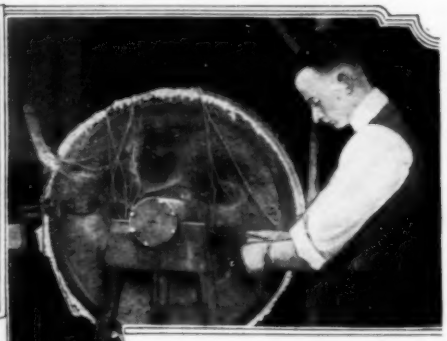
RANGING from an improvement in the quality of false teeth to settling disputes between buyers and sellers of blackstrap molasses, the government bureau of standards at Washington, "yardstick of industries," as it is sometimes called, determines the fitness of almost everything manufactured and used by the American people.

To do its work, the bureau is equipped with instruments and machines varying in size from those too small to be studied with the unaided eye to ponderous devices requiring an immense building to house but a single one of them. Could the combined value of the information annually conveyed by this institution to the industries and home owners of the country be estimated, it would probably be found to amount to many millions of dollars. In the manufacture and use of automobiles alone, great strides in the improvement and design of parts that go into them have been made solely through the results of researches by men who have made it their business to help the buyer to get full value for his money, and the builder to be assured of the best of material for his purpose. Great decreases have been accomplished in the yearly toll of life claimed by accidents to railway apparatus by vital changes in process and method of their making, as recommended by the bureau, where painstaking study reveals weaknesses in mixing or casting of metals usually unperceived by experts on the outside. Through the bureau's efforts, brake linings on automobiles are now made three times as good as they were several years ago, and steel rails are not quite so likely to break under the wear and tear of trains as they were some time ago. All this is due to tests and experiments made by those who endeavor to learn the best ways and safest methods by which human life can be protected by improving the things that affect it.

The materials that enter into the construction of our homes are subjected to artificial conditions, in imitation of natural wear, and houses are even built and deliberately burned down to disclose weak spots, if any, that exist in their design from a fire-safety standpoint. To test iron railroad-car wheels, stress is put upon the plate, and the rim is heated to a point corresponding with that caused by friction against the rails. A brake pressure is applied suddenly, much like it occurs in service, and the results of the trial are carefully checked in an effort to prevent cracking in such wheels in the future. Users of gasoline now consumed in the

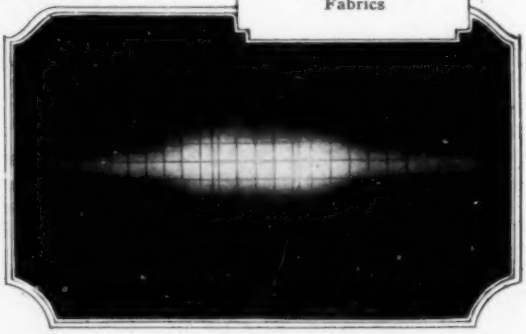


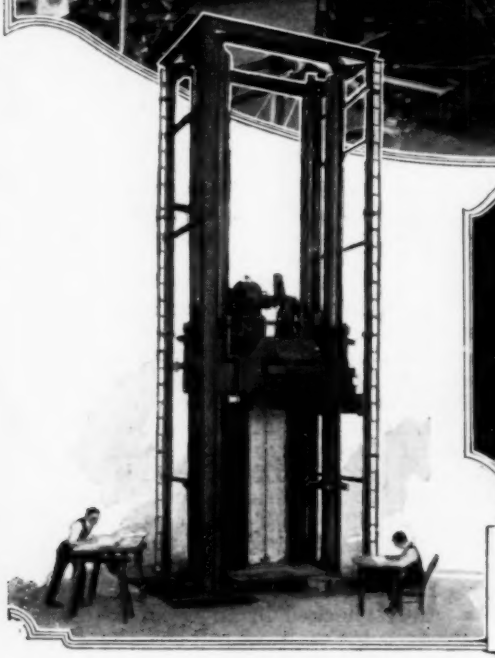
Apparatus for Testing the Beams of Automobile Headlights in Photometric Section of Standards Bureau



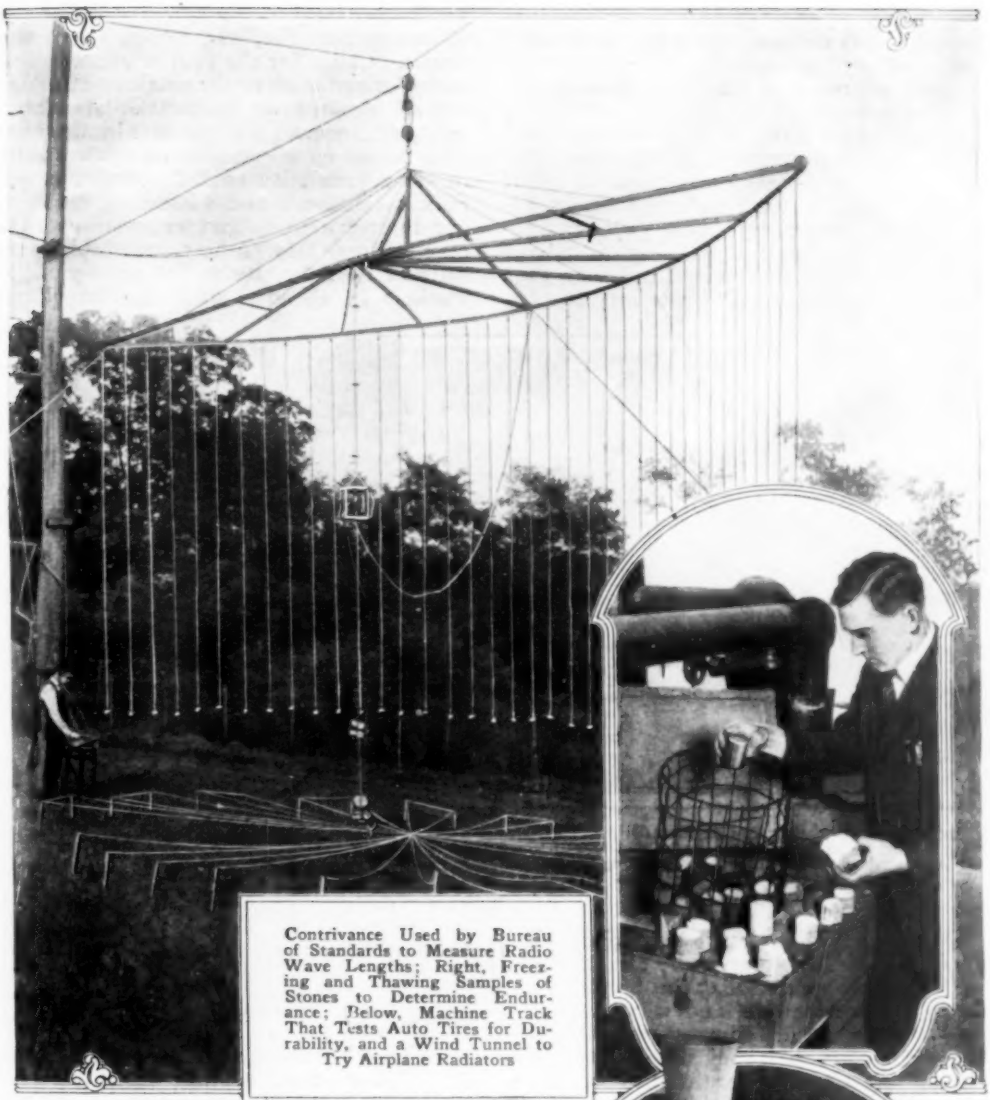
Getting Cast-Iron Car Wheel Ready for Test to Show Cause of Cracking

Miniature Cotton Mill in Operation in Textile Division Where Experiments Reveal Much Valuable Information That Aids Manufacturers and Users of Fabrics

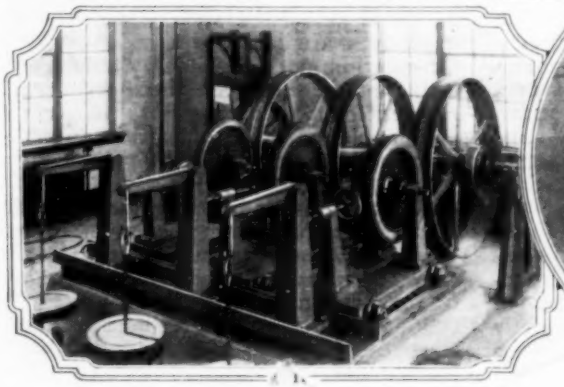


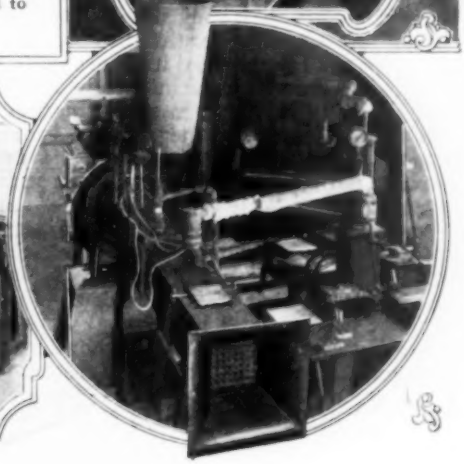


Well Adjusted Beam of Automobile Headlamp; Each Square Represents Twenty-Four Inches at a Distance of 100 Feet from Car; Left, Testing Strength of Brick Walls with Massive Machine That Crushes Sections of Assembled Materials

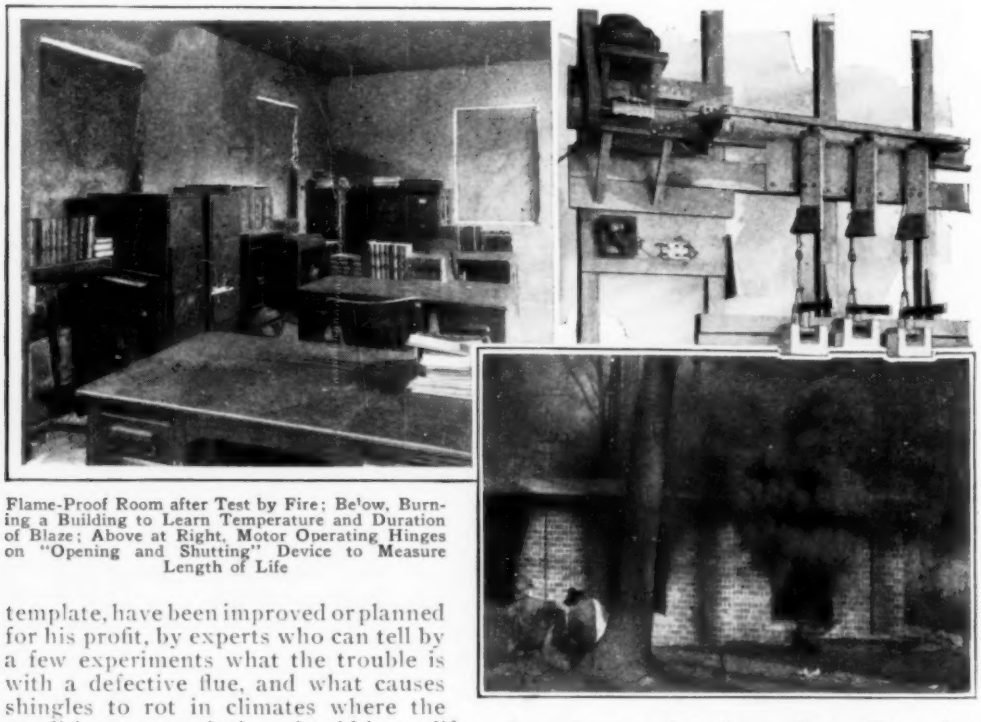


Contrivance Used by Bureau of Standards to Measure Radio Wave Lengths; Right, Freezing and Thawing Samples of Stones to Determine Endurance; Below, Machine Track That Tests Auto Tires for Durability, and a Wind Tunnel to Try Airplane Radiators





operation of the fifteen million automobiles in this country share in the benefits of cheaper fuel supplies by means of a plan the bureau of standards designed to utilize a less volatile product. Weights and measures have been so standardized by the institution that in hardly a case can the buyer of a commodity be deprived of full quantity of his purchase without detection of the discrepancy. New arrangements in storage and packing, design of warehouses, and a thousand and one things the man on the street is too busy to consider, have been improved or planned for his profit, by experts who can tell by a few experiments what the trouble is with a defective flue, and what causes shingles to rot in climates where the conditions are such they should last a lifetime. In all, the peculiarities of place, weather and the material itself are brought out in exhaustive experiments which seldom leave anything to the imagination.



Flame-Proof Room after Test by Fire; Below, Burning a Building to Learn Temperature and Duration of Blaze; Above at Right, Motor Operating Hinges on "Opening and Shutting" Device to Measure Length of Life

Cement, rubber, leather, paints, bronze, copper, fire-extinguishing fluids, and even scouring compounds, have all been measured by the "scientific yardstick" and standards prescribed for their manufacture to insure the final possessor of a first-class article that will "stand up" under the service for which it is intended. Problems of housing and building and the assembling and broadcasting to home owners of information in the interest of cheaper and better dwellings are daily receiving increased attention at the hands of technical men, who first weigh and examine the facts in the laboratories of the bureau before they are passed on to the public. Codes for the proper operation of factories and mills or the working of mines are all devised by bureau of standards safety engineers. The careless lumberman who bunks on a cot near an open fire or in close proximity to inflammable materials is cautioned and advised of his danger in instructions and suggestions that may tell him how to be comfortable with little or no risk. Rules for protection of workers in all sorts of industrial plants have been gathered together. Gas safety codes, protection against lightning and precautions for guarding limbs and eyes of those associated with machinery and explosives are laid down in an array of information made possible by hundreds of tests that have showed at least seventy-five per cent of most accidents to be preventable by changing some detail in an article of manufacture.

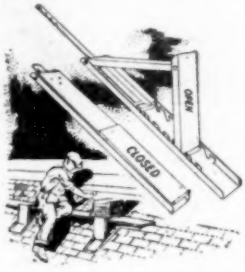
¶Chicken raising is being recommended as a career for young women in France. One municipal councilor suggests that they form themselves into colonies, and on one farm now the girls have charge of 500 hens or more. Freedom from the strenuous activities of the city and life in the open air a— given as the advantages.

Britons to Refloat German Fleet Sunk at Scapa Flow

For the first time in history, the task of refloating an entire sunken fleet is to be undertaken, according to word from England. The British admiralty has arranged to raise the German fleet that was scuttled in 1919 at Scapa Flow, in the Orkneys. It is claimed that the project will be the largest salvage job ever undertaken. After the vessels have been refloated, they will be scrapped. It is expected that most of the metal obtained will go to Germany, where it will be turned into cutlery. Fortunes are said to have been made and lost in salvaging ships that were sunk during the war. The British government itself is reported to have raised vessels and cargoes valued at $340,000,000 in the past five years, taking $34,000,000 in gold bars from the wreck of one steamship, the "Laurentic."

Folding Metal Roof Bracket Saves Time in Laying Shingles

Quickly adjustable to any pitch of roof, a patented folding metal bracket has notches for support nails so that it may be removed simply by unhooking it. To apply tight sheathing boards, four holes are punched in the body, through which it is possible to securely anchor the bracket to the rafters. Such a provision it is pointed out, makes an ideal support for laying Spanish tile. For the convenience of carpenters, an adjustable stop holds planks tightly against the roof and also prevents shingles or tools from falling. Notched strips with side locks permit the bracket to be adjusted to six different angles.



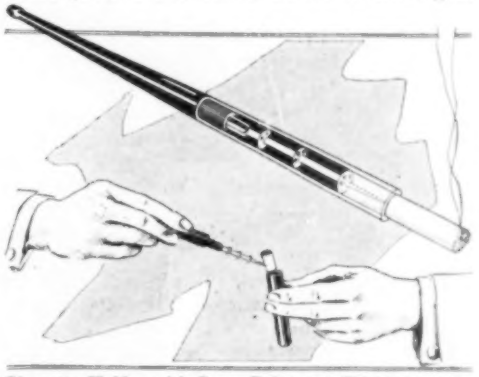
Ice Box Carried on Running Board Adds Comfort to Auto Trips

Neatly fitting inside the luggage carrier on the automobile running board, a small ice box is being manufactured to supply tourists with cold drinks and to keep foods fresh and cool. The refrigerator has a capacious compartment for packages and a rack for bottles, jars or cans, is fitted with double walls, well insulated, and is lined with galvanized sheeting that is easily cleaned. A tight-fitting lid keeps out dust and dirt. The box is twenty-one inches long, ten inches wide and twelve inches high and holds about fifteen pounds of ice. It weighs only sixteen pounds empty. The outer metal covering is finished in glossy black to match the car.

Adding Luxury to Journeys. Small Refrigerator Is Easily Packed and Does Not Rattle

Filter in Cigarette Holder Cools and Cleans the Smoke

To hold a cigarette firmly in place, a holder has been patented with a sharp point in its center. A series of perforated shields filter the smoke and make it easier to clean the stem. A cooler and cleaner smoke, absence of stained fingers, and the fact that it is almost impossible to drop the cigarette are some of its advantages.



Cigarette Holder with Spear Point and Shields to Filter the Smoke

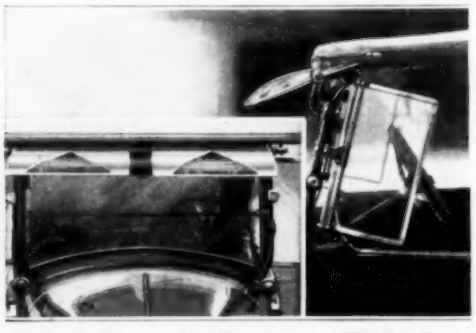
Broom with Two Heads in Holder Is Easily and Quickly Refilled

When a patented broom now on the market becomes worn, the head can be turned over in its cleverly designed clamp holder, thus permitting use of both ends of the straws. New "fillers" may be inserted as often as necessary. The broom sweeps easily and thoroughly, saves the expense of a new stick, and is light and quickly adjusted. A heavier style is manufactured for warehouse duty.

Reversing Head of Broom Is Accomplished by Turning Filler in Its Clamp Holder

Auto Sun Visor May Be Adjusted from Inside Car by Driver

Glare of headlights or of the sun is kept from the automobile driver's eyes by an aluminum shade that may be instantly adjusted from inside the car. It is placed over the windshield and has triangular-shaped inserts of transparent material in blue, green or amber color. The shade is suspended on a steel rod which is attached by brackets and has a handle extending within the car, so that the driver can raise or lower it without leaving his seat. A division between the sections permits clear vision of the road or sidewalk to the right when the visor is down. With the shade, transparent side wings that will not warp or crack are manufactured. They are mounted in polished aluminum frames.



Aluminum Visor with Transparent "Windows" and Side Wings to Shield Auto Driver's Eyes

Armored Mail Bags to Protect Contents during Shipment

Collapsible mail bags reinforced by iron plates on the sides, have been designed by the postoffice department to prevent injury to the contents. The plates are attached to the ordinary sacks, add but little to the weight or bulk of the bag, and effectively shield letters and packages. To test their efficiency, an armored sack filled with empty pasteboard boxes was subjected to the weight of a heavy man. The contents were uninjured. Damage to mail packages amounts to millions of dollars yearly, it is said.

Spider Webs for Surveyor's Lens

Without the assistance of spiders, accurate surveying would be almost impossible. Every year a certain species, known as the Michigan gray and brown spotted, is raised for the manufacture of the cross-hairs for surveyor's telescope, field glasses and articles of like nature. Strands of the delicate "silk" the spider spins, not more than five ten-thousandths of an inch thick, are stretched across the diaphragm of transit telescopes and other instruments to tell the surveyor when his glass is pointed correctly for accurate readings. A coarser thread would appear so large under the powerful lens that it would obscure most of the vision. Platinum has been used for this purpose, but becomes brittle and breaks when drawn fine. Spider webs have been in service in some instruments for forty years and are still intact.

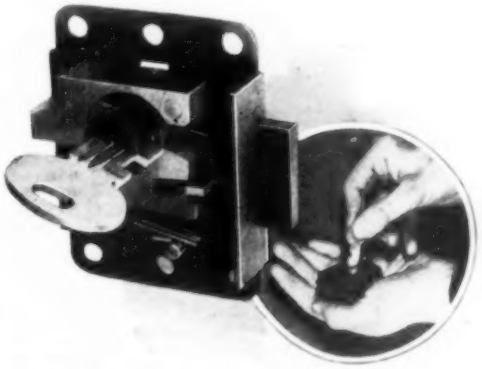
"Roping" One of the Huge Statues of Stone Age Beasts in Grounds of a London Park after the Grotesque Images Were Renovated and Retouched by Sculptors

Dragons of Stone Age Lassoed and Hauled from Mud

After lying for a long time partly submerged by mud and weeds in the grounds of the Crystal Palace in London, a collection of prehistoric animals carved from stone were renovated and cleaned by a crew of workmen. The weatherbeaten claws and teeth of the big statues were smoothed and sharpened and a coat of paint was applied to the eyes to restore the natural "expressions." Sculptors renewed details that were obliterated by time and weather, and scale-armor "hides" were scrubbed to bring out the original coloring of the stone. Since then the realistic appearance of the statues has attracted much attention.

Lock with a Million Combinations Guards Money Boxes

Capable of being adjusted easily to a million combinations, a lock has been invented which is designed to give positive protection to users. The principle of the barrel and tumbler lock is applied in its construction. The front is of hardened steel and the mechanism is so arranged that only a master key can open more than one lock. The inventor spent six years in study and experiment and his lock now has been approved by the American Telephone and Telegraph company for use by its operating companies for pay station purposes. Plans are being considered to design similar locks for other uses.

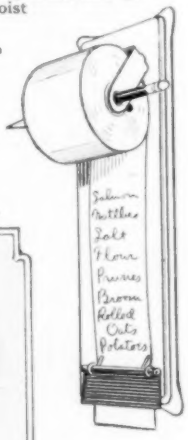


Interior Construction and Relative Size of Diminutive Lock that Permits Million Combinations

Time and Money-Saving Tools

Getting Quick Breakfast Is Easy with Percolator and Electric Toaster That Browns Both Sides of Bread at Once; Above, Jardiniere with Water Reservoir and Wicks, Bent like Siphons, to Keep Soil Moist

Handy Spool of Paper and Pencil Holder Combined for Keeping Kitchen Memoranda



Sanitary and Convenient Cabinet for Holding Soiled Clothes; Has End or Top Openings and Occupies Little Space in Bathroom or Kitchen

Suggestion for Making Money from the Washing Machine—an Electric Switch That Supplies Power Only When Coin Is Dropped into It

Necklace of Bright-Colored Beads, Cut in Form of Blossoms, Has Fragrance of Flowers and Takes Place of Costly Perfumes

Revolving Electric Dishwasher That Utilizes Principle of Centrifugal Force; Water Is Driven through Slots in Aluminum Bowl in Jacket

Anyone wishing further information on devices described in the editorial pages can

for Woman's Workshop in Home

Hollow-Metal Smoking Stand with Weighted Base Cannot Tip Over and Keeps Ashes from Floor; Cigar and Cigarette Stubs Pass into Waste Bowl at Bottom to Be Dumped Out Later

Electric Light with Current Outlet in Cord for Attaching Flatirons, Toasters or Other Appliances

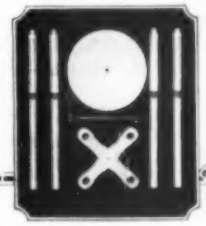
Collapsible Two-Wheeled Baby Carriage Folds Together as Compactly as a Cane

Fireless Cooker, Hot Plate and Electric Range Are Combined in One Convenient Article for Many Kitchen Uses; Heating Cord Is Attached to Light Socket

Wall Bracket for Flatiron Switches on Current When Iron Is Removed from Shelf, and Signal Light Warns User to Put It Back

Pressing a Button Converts Vanity Case with Outside Bulb and Concealed Batteries into Convenient Searchlight

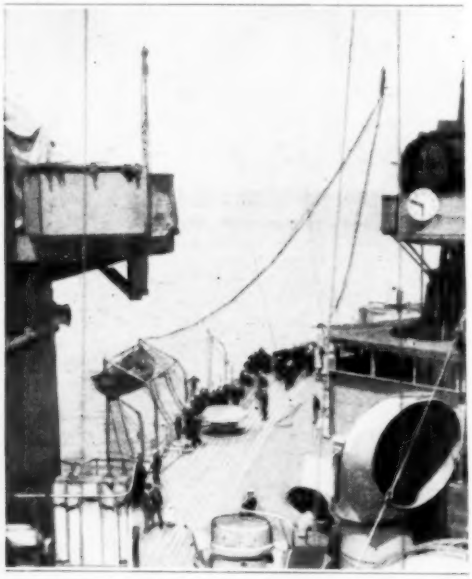
Assembled Easily without Tools, Screws or Glue, Strong Kitchen Stool Serves Many Purposes and Is Easily Taken Apart



obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago

"Clocks" on Battleships Give Range to Crews at Target Practice

High upon the masts of Uncle Sam's battleships, what appear to be ordinary clocks play an important part in directing



Range "Clock" Mounted in Conspicuous Position on Battleship's Mast to Guide Gun Fire

the fire of the big guns. They are range dials on which the distance of the target is indicated and signaled to ships ahead and astern. The figures run from zero to nine and in sending the ranges, the first 10,000 yards are added in each case. Thus, to show a range of 18,500 yards the small hand is placed at the figure eight and the large hand at the figure five.

Traffic Plan Would Divide Autos According to License Numbers

One of the ways being considered in Boston to relieve traffic congestion is to allow automobiles with even license numbers use of the streets in the crowded districts one day, and those with odd numbers the next. The restriction is intended to apply only to so-called pleasure cars during business hours. All auto owners would be allowed to drive down to work and go home in their cars, regardless of their license numbers, but would have to be governed by the digits of their license tags if they wished to drive into the busy areas at odd hours. By 1930, it is estimated that Massachusetts will have 1,000,000 registered automobiles, about twice the present number, and the "Hub City" is considering various measures to solve the ever-increasing traffic jams. Revised parking regulations, underground construction and a system of traffic signals whereby crowds would be moved in larger units, are other plans under discussion.

Heart of Old Oak Tree Is Witness in Dispute over Boundary

Because the stake planted in 1838 by surveyors measuring Iowa land, lately disputed by surrounding owners, had disappeared, an old oak tree standing near the spot and which was blazed to mark the pin's position, has been opened in search of the scar. Through records on file that describe the tree as it was 85 years ago, its identity was figured out by experts. Cuts five inches deep were made around the place where the evidence was thought to be and, when the block was removed, the marks were found buried deep in the wood.

Grater and Slicer Combined Save Cost of Extra Utensils

In preparing a wide variety of vegetables and other foods, a combination slicer, grater and shredder has been found convenient in the kitchen. It is made of heavy tin, and its cylindrical sides have coarse and fine perforations and various cutting edges to form a suet shredder, potato chipper, nutmeg grater and a number of other

Two Views of Grater Showing Variety of Surfaces for Preparing Many Kinds of Food

articles in one. It is light and strong, easily cleaned, has no breakable parts, and saves the cost of several extra utensils.

BOBBING SPELLS DOOM OF TONS OF HAIRPINS

Thirty tons of discarded wire contraptions, mostly hairpins, were found when deputy sheriffs raided squatters occupying shacks on a city dump in Chicago. The discarded pins covered a space some fifty feet square and in places they were banked up in piles over four feet deep. Hairdressers advanced the theory that the accumulation was due to the spread of the fashion for bobbed hair among women.

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Hill of Hairpins Found on a City Dump Where They Were Piled in a Tangled Mass Fifty Feet Square and Left to Rust Away Amid Heaps of Other Refuse

Phone Guide Printed on Paper Reel Gives Numbers Quickly

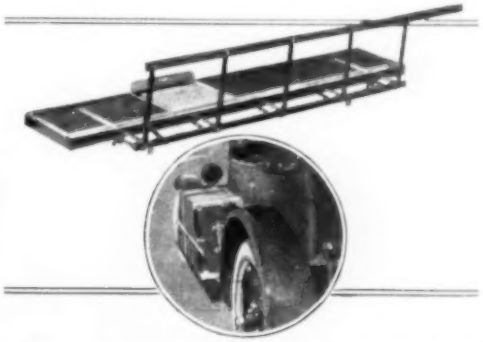
Time is saved in finding telephone numbers by printing or writing them on a strip of paper attached to a reel within a cabinet holder for which a patent is pending. A knob at one side turns the paper and with an alphabet and red line guide, the desired information is found quickly. New numbers and names may be placed in ruled columns as needed.

Films and Money Get Most Silver

With the exception of the government mints, the greatest users of silver are said to be the photographic industries, which employ large quantities of the metal in the manufacture of films. Although the output of motion-picture reels claims an enormous supply of the precious mineral, ammunition for the amateur's cameras and for professional photographic work represents a big demand for it. One-third of the world's silver is produced in the United States, with Mexico closely following in size of production, and Canada third.

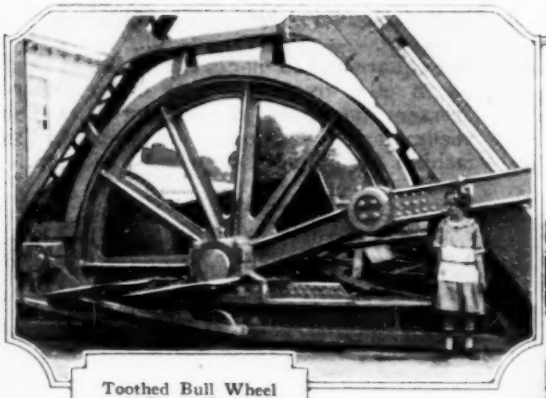
Folding Luggage Holder for Autos Carries Trunk and Bundles

Almost any size trunk or package may be carried on the running board of an automobile with an adjustable luggage holder that is invisible when not in use. When not wanted, it slides out of sight.



Adjustable Luggage Carrier for Automobile Which Will Take Almost Any Size of Package

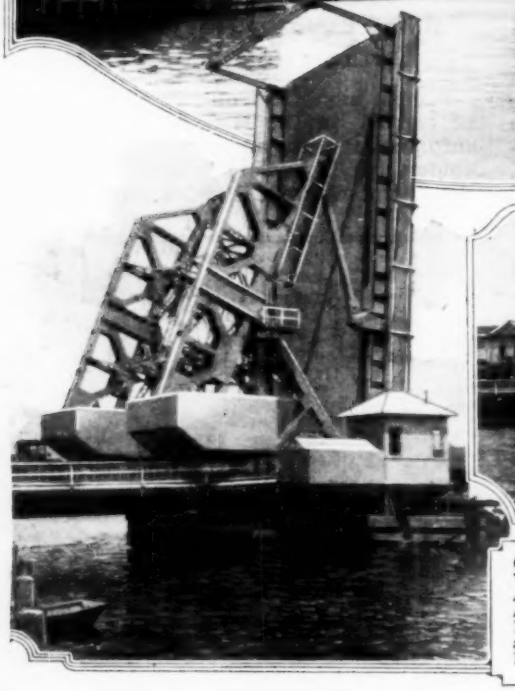
By releasing winged nuts, the carrier can be pulled out and the sides raised, being automatically locked in position.

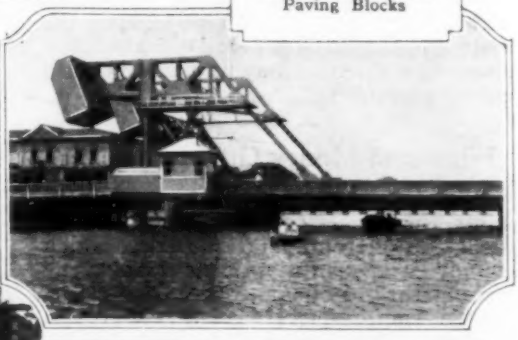


Toothed Bull Wheel and Giant Knuckle-like Joints of Steel Arms That Lift Bascule Bridge as Hidden Motors Give Them Life

Swinging Big Trusses of the Counterweight Structure into Their Overhead Position

Bridge Partly Open, Showing the Action of the Two Heavy Jointed Arms That Link the Massive Counterweights to Their Burden; Metal Shelves Hold the Paving Blocks





Completing the Lift; at Left, Span Standing Vertical, while Counterweight Trusses Are at an Angle Due to Different Planes They Travel; Above, Structure Lowered for Bridge Traffic with Ponderous Concrete Blocks Balanced Securely above Roadway; Railed Platform around Trusses Permits Inspection and Oiling of Moving Parts

Shelves on Drawbridge Hold Paving When Structure Is Raised

Several interesting features have been built into a "knife" bridge at Mystic, Conn. The structure is so designed that, in case the machinery is allowed to run after the span is closed, it will immediately begin to open again, thus preventing damage to the motors. Special locking mechanism is provided to stop it from being thrown over by the wind when fully open. The bridge is built to carry a large volume of heavy traffic and supports a single trolley track in the center of a thirty-three foot roadway. A nail through each block of the wood paving secures them in place, while the cement walks are laid in large slabs. The total weight of the moving parts is approximately 650 tons. The counterweight operates through a considerably smaller angle than the span.

Auto Tool Box on Casters Makes Seat for Garage Worker

Moving easily on casters and so compact that it may be rolled under the running board of an automobile, a strong box with five drawers of different sizes for holding screws, nuts and bolts is being manufactured. The flat top can be used for a seat. A lower compartment may be used for the larger tools. It is well made and finely finished.

Parrots Live for Thirty Years

Of the twenty commonly known varieties of parrots, the most talkative ones, according to George Bruce Chapman, head of a London house that has imported and sold the birds for more than one hundred years, are the Brazilian Amazon and the African Grey. The former has bright blue and yellow feathers and red tips to the shoulders and flight wings. The African Grey has a red tail. In Brazil, natives watch the nesting places and when the fledglings are a few days old, the feathers of one of the wings are trimmed. Later these birds are easily captured, placed on perches and taken to the nearest village. Fanciers say that the birds should be fed twice a day and if given proper care will live thirty years.

Violin Combined with Two Horns Is Said to Have Unique Tone

Novel variations of the tone of the violin are said to be produced with a horn placed under the instrument to amplify and

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Known as "What Is It." This Violin Is Said to Possess a Unique Tone

change the quality of the sound. It is similar in shape to a radio "loud speaker" and a smaller horn near the player's ear aids in keeping the proper pitch. The instrument is shaped so that it can be held easily and occupies but little space in a traveling case.

Toast Is Kept Untainted by Gas with Asbestos-Tin Grid

So that toast can be made on a gas stove untainted by the fumes, a round asbestos mat has been made. This is covered by

Asbestos Toaster with Metal Grid that Prevents the Slices Being Spoiled by Gas Fumes

a tin grid that holds the slices away from the surface. The result is an even browning without any tendency to burn.

Ten Dozen Pies from One Pumpkin Are Served at Banquet

One plump pumpkin, grown in a California field, furnished joy for scores of inmates in an old people's home not long ago

One-Hundred-and-Twenty-Five-Pie Pumpkin as It Came from California Field

when it was presented to them and made into 125 pies for a dinner. More than sixty pounds of "meat" were extracted from the pumpkin, which weighed nearly ninety pounds as picked from the vine.

Weather Records as Detectives Help to Clear Up Mystery

Weather records are constantly put to many uses, according to J. Cecil Alter, meteorologist at Salt Lake City, Utah. The forecasts, daily consulted by millions, are only part of the service rendered by the bureaus. Companies that write weather insurance largely base the amount of the premium charged on the risk as shown by reports covering a long period of years. By consulting the government figures on rainfall, a shrewd umbrella dealer was able to order his stock at the most profitable time and a group of chemists and capitalists decided on the location of a $25,000 plant. The reports also solved the mystery of an alleged shortage in coke shipments when it was found that the loss of weight was due to moisture evaporation caused by hot winds and sun. Fruit and nut growers commonly consult the weather records before planting large orchards, and in a hotly contested lawsuit the rainfall records were quoted to show that the varying seasons and not a mine tunnel were responsible for the dwindling supply of water in an irrigation stream.

Caisson Drives Way to Coal Vein When Mine Shaft Fails

Sunk through 160 feet of water-bearing sand and gravel, a pneumatic caisson was designed and installed when ordinary methods failed to open up a seam of coal in Indiana. Two tubes were sunk, one forming a passage for men and materials for the main shaft. Both caissons were reinforced with steel rods fitted with pipes to lubricate the outside surface with water, steam or air, to insure an even downward movement. Dirt and rock were blasted out and removed with an orange-peel bucket, compressed air being used to exclude water. The tubes were anchored and sealed under air pressure with concrete to make them water-tight. The mine has a capacity of 1,000 tons of coal daily.

Cream Whipper Is Run by Water, Saving Time in Cooking

Run by water from the kitchen faucet, an egg and cream whipper and a mixer for various purposes has been placed on the market. It consists of a small turbine to turn the blades which are inserted in a glass bowl. A short length of rubber hose

Glass-Bowl Mixer and Whipper Attached to Faucet; Outlet Hose at Left

provides an outlet for the water. The parts are easily kept clean, perform the operations thoroughly and save time.

Movie Faces Are Revealed by Tape Measure

BECAUSE few perfect "camera faces" can be selected at random from among the thousands of applicants for places in motion pictures, a mathematical system of measurement has been devised to determine which aspirants have the proper facial proportions attractively to express the human emotions, a requirement that equals beauty in its importance to the screen actor. The test has been reduced to such a practical basis that the ambitious recruits to the ranks of silent drama can easily apply the method to themselves, with only a mirror to assist them in taking the measurements of their faces.

In the studio where the process is being used, the subject is first treated to a close study from the director, who with the aid of an assistant, a T-square, a triangle and tape measure carefully determines the distance each facial feature is from the others, the contour and general construction. In order to class a person among good photographic subjects, it is necessary that every curve and line of the face bear a certain mathematical relation to all the others. Since the camera calls for certain types of structure and shape of face for its work, it is said that the majority of beautiful women do not come within the re-

quirements. The lines of the chin, for instance, must form the proper angle when looked at squarely. The nose must be at the right distance from the eyebrows, and the mouth, when measured by the tape line, must never be one-fifth larger in a smile or laugh than at repose. To register some of these finer details, the director employs calipers, and tests the straightness and length of imaginary lines through the center of the ear and over the head with the T-square much as a draftsman checks up the perfection of his drawing.

Lighting is considered from every point. Shadows caused by contour of the face must fall in such a way as not to influence the effect of emotional expressions, and where possible, the applicant is even tested for increased value certain light rays might give to the artistic worth of the features. With a steady trend toward productions where the principal points of the plots are conveyed through suggestion expressed by the actor's face, rather than by action, it has been shown that the success of a play depends largely upon the ability of the characters to interpret the dramatic situations with the significant "language" of facial expression.

Airplane Coaster Gives Children Flying Thrills on Ground

Designed like a real airplane, a three-wheeled coaster that is said to give children many of the thrills of a genuine flier, has been invented by a former aviation instructor. It is propelled by pedals and guided by a stick control and hand lever modeled exactly after those of aircraft.

Just Like an Airplane, Coaster Gives Many Thrills Even if It Doesn't Fly

When the wheels turn, a propeller in front, attached to the axle by a belt, whirs with rapidity. A rudder turns with the steering wheel and the airplane effect is increased by V-shaped "landing gear," realistic monoplane wings and rubber-tired wheels. The body, constructed of light sheet iron, is designed after army training planes. The coaster holds two children, has an adjustable seat, and a small child can lift it easily.

Keyless Padlock Worked by Figures on Movable Disks

Opening and closing through a series of round, flat tumblers that rotate about a circular center piece, a padlock has been invented to operate without the use of a key. The disks are stamped with sets of figures which can be arranged in combinations to unlock the bolt from its socket. Greater security is said to be insured by the lock, owing to the difficulty of working out the proper groups of numbers that control the latch. The device is strongly made and can not be easily damaged.

River Is Bombed by Army Planes to Break Up Ice Jams

Ice jams that annually have congested the Platte river, doing much damage to railroads, bridges and farms were demolished effectively this year by blowing them up with bombs dropped from three army planes. In previous years, a dynamiting crew was maintained on an island near Omaha to smash the jams with sticks of the explosive. Last winter the Union Pacific railroad resolved on more drastic methods and two army planes were obtained from Langley Field. They were joined by a De Haviland bomber from Ft. Riley. Flying seventy-five miles up the river, Lieut. John F. Whitley in charge of the expedition gave orders to start the "battle." The planes opened their attack on a big jam close to the North Bend bridge. Carefully aimed so as not to damage the structure, twelve 300-pound bombs were dropped into the gorge. Ice cakes were blown hundreds of feet into the air and in a few moments the jam was broken.

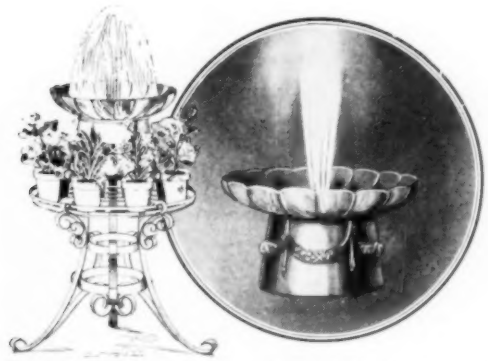
ALLIGATORS GROWN ON FARM ARE SOLD BY MAIL

Owing to the rapid decrease in the numbers of alligators found in the rivers of Florida, a farm has been devoted to the breeding of the reptiles for marketing. Specimens up to 20 inches in length are sent by parcel post to purchasers in all parts of the country, inclosed in strong wooden crates. Many of the "herd" have reached an age of several hundred years and some have been tamed so that they can be approached or handled without danger. In the wild state, they have been known to live for ten or twelve centuries, it is said. New teeth grow in the mouths of the alligators when the old ones wear out, the average reptile using about twenty-two sets during its lifetime, it is said. In captivity they are fed but once a day, those weighing 1,000 pounds or more consuming over forty pounds of cheap meat and low-grade fish at a meal. On the farm, attendants go about in early summer searching for eggs which are placed in incubators where they hatch. Young ones are in great demand for their heads and claws which are used as ornaments, but those bigger than six feet long command prices of $100 and higher. More than 10,000 "'gators," it is estimated, are sold every year by one large ranch that supplies many of the country's zoos, circuses and museums.

Herd of Tame Alligators on Florida Ranch Where Reptiles Are Raised for Market

Indoor Electric Fountain for Home Run from Light Socket

Any electric-light socket will supply the current for a color-changing fountain that can be used in the living room of a home. It is self-contained and two gallons of water is all that is needed to keep it in operation. The water is circulated by an electric pump which forces it out in a fine spray. Color effects are obtained by rotating screens which, catching the light rays, give the appearance of a shifting and ever-changing rainbow. The device is also adapted for use in ponds the waters of which are purified by continuous aeration.



Electric Color-Changing Fountain for Indoor Use Which Gets Its Power from Electric-Light Socket

Glass Handle on Envelope Sealer Holds Supply of Water

Envelopes are quickly and neatly sealed with a small glass tube holder carrying a felt plug in one end. Sufficient water seeps through the fiber material to moisten the glue. From fifty to seventy-five envelopes can be sealed with one filling of water. The holder is protected from breaking by covering it with paper or rubber bands.

Knife and Fork in One Utensil Aids Single-Handed Persons

To aid persons having the use of but one hand, a combination knife and fork has been designed that can perform the work

How Combined Knife and Fork Helps One-Armed Persons to Enjoy Their Meals

of two separate tools. It relieves the user of the necessity of continually discarding one article to take up the other. Made of ordinary cutlery metal, the utensil has a curved blade and morsels of almost any food can be picked up by its point.

Folding Centerboard for Rowboats Adapts Craft for Sails

To aid in changing a rowboat into a sailing craft, an inventor has marketed a canvas centerboard that folds up against the keel when not in use. The device can be easily installed and may be opened up in a few moments by the occupant of the boat when changing from oars to sail. Made of tough fabric, it resists wear and tear in beaching the craft, while a spring arrangement prevents injury should it come in contact with obstructions under the water. Two screws and a handful of tacks are sufficient to attach the centerboard.

Portable Canvas Centerboard Attached to Keel of Rowboat and Spread Ready for Duty

Many Small Diamonds Are Welded in One to Form Large Stones

Assembled diamonds, large stones composed of a number of smaller ones so carefully joined together that it is difficult even for an expert to tell where the "welds" have been made, are now on the market. The parts are cut in a special way and then put together under a patented process that secures the single-stone effect. The diamond prepared in this way is, of course, cheaper than the natural gem of the same size which it is said to rival in brilliance and symmetry.

Carbon Is Prevented by Spark Plug Having a Closed Shell

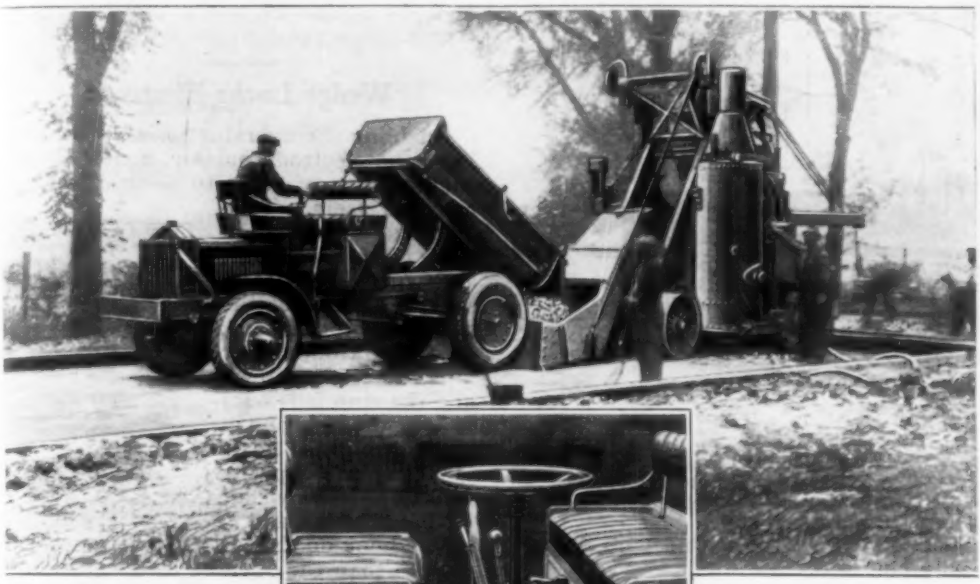
By eliminating the chamber between the insulator and the shell, an inventor has designed a spark plug to prevent the formation of carbon. A cushion of asbestos yard packing has been inserted about the insulator inside the shell to take up expansion and contraction. Firing points are kept clean by the flame of the explosion which sweeps off excess oil before it can bake into carbon. If leaky cylinders foul the plug, it can be cleaned easily by scrubbing the nose of the insulator with a brush or rag without taking it apart.

Potatoes Are Substitute for Soap

Grated raw potatoes and soft water are said to have been used successfully in China as a substitute for soap in washing delicate silk garments. The potatoes are prepared two or three days before the washing and in about the ratio of two pounds to a gallon of water. When the sediment has settled, the clear water is drawn off and passed into vats. Dipping the garments into the liquid is said to clean them thoroughly without rubbing.

DRIVE TRUCK FORWARD OR BACK WITH EQUAL EASE

Specially designed for road construction and maintenance work, a new truck may be driven in both directions with equal facility by the chauffeur. There are two seats, facing each other, in the driving compartment. The change in the operator's position from one side to the other does not change his relation to the pedals; when facing and driving backward, the foot pedals are automatically reversed, and require no attention, as the left foot is always on the clutch pedal, and the right on the brake pedal, regardless of direction. When changing over, the operator merely throws a lever, located on the right-hand side of the cab, in the direction in which he desires to drive, then engages the transmission gears through the shift and clutch levers in the ordinary manner.



Chauffeur Facing Backward and Driving to Mixer; Below, Close-Up of Driver's Cab

The truck has a range of five speeds backward as well as forward, including a very low speed for heavy pulling in both directions. This novel arrangement not only eliminates a lot of lost time on the part of the operator, but removes the necessity for turntables, and prevents breaking of forms on the road, as the truck need not be turned to be driven away.

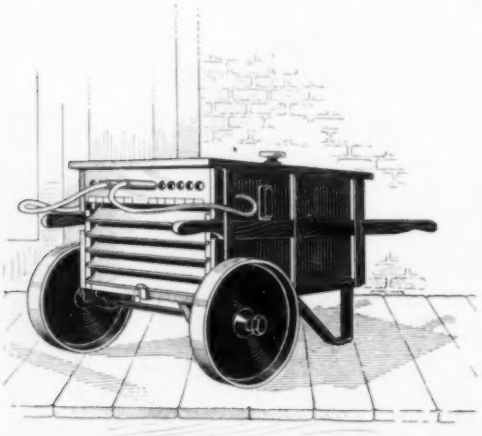
Oxyacetylene Cutting Tip Preheats Gas

While embodying all the desirable features of the standard tip, a new oxyacetylene cutting tip has additional features that mark it as a signal improvement. The distinctive features are a method of mixing the gases very thoroughly and preheating the cutting oxygen, as well as giving added velocity and penetration to the preheating and cutting jets. A further improvement is that the tip may be provided with a renewable seat at a fraction of the cost of a complete tip, rendering it unnecessary to re-machine or discard the used tips. The renewable seat also facilitates the cleaning and maintenance of the tip. The mixture of the preheating gases takes place in multiple passages in the seat; the gases then enter an annular passage, where they are given a swirling motion and an additional mixing.

¶A carriage-spacing attachment is being manufactured for engine lathes that allows the carriage to be spaced to an accuracy of .0001 inch.

Arc-Welding Machine Operates on Any Power Supply

Designed to operate on practically any power supply, a universal welding and cutting machine is now on the market. The



Portable Arc-Welding and Cutting Machine That Operates on Practically Any Voltage

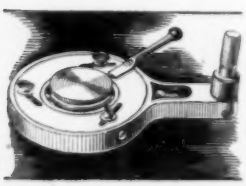
machine is mounted on wheels to make it easily portable.

The variations in voltage are met by varying the combination of the coils of the primary winding, 110, 220, and 440-volt current being taken care of in this way. To make the machine operate on 25 to 40 cycles, taps and adapter windings are used. The apparatus will also operate on 110 and 220-volt direct current, using a resistor-reactor combination in the secondary winding. The blower and automatic switch operate on all voltages.

The apparatus can be used for nickel spotting, lead burning, spot-tack welding, etc., as well as for all arc welding, and can easily be handled by one man.

Hand Tool Regrooves Pistons

Designed particularly for use in garages where a lathe is not available, a new hand-operated piston regroover makes a valuable addition to the shop equipment. It is said that the tool will save time even where a lathe is ordinarily used, as the entire job can be done with it in less time than a mechanic can true up one piston in the lathe. Another advantage is that all pistons, when finished, have grooves of the same width, and that .015-in. overwidth rings are a perfect fit, which is not always true of pistons grooved in the lathe. The standard equipment furnished consists of tools and guides for 3/16 and 1/4-in. grooves, and a tool for chamfering the lower grooves for oil holes.

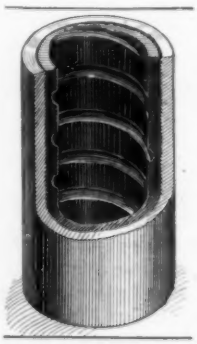


Wedge Locks Electrode

Enabling the operator to insert and release the electrode quickly, a new holder should prove of value to electric welding machine users. The electrode is locked in place with a wedge, and when it is necessary to knock out the stub of an electrode, the operator merely taps the wedge down, and the stub falls out; to lock the new one in place, the wedge is tapped in the opposite direction. The wedge cannot drop out and be lost, as it is formed with a hook on the top and is larger at the bottom than the opening in the socket of the holder. Various sizes of electrodes can be used in the holder.

Rubber Pump Bearings Avoid Cutting and Scoring

Two problems, long the bugbear of pump manufacturers, have been solved, it is claimed, by the use of a bearing having an inner surface of rubber. This bearing solves the lubrication problem by lubricating itself with the water or other liquid that the pump is handling; cutting and scoring are also said to be eliminated. Tests have shown that the friction on wetted rubber of the type used is lower than on an oiled babbitt surface. By the action of the shaft, a constant stream of water is circulated through a spiral groove in the bearing; when a piece of sand or grit gets into the bearing, it cannot find lodgment in the highly resilient rubber, but is thrust into the groove, where the flow of water carries it away. Even when operated for a



considerable period without water, it has been found that the bearings were not harmed in any way. The resiliency of the rubber also nullifies the whip of long shafts to a great extent. These bearings have also found favor for marine work, as stern-tube and outboard-strut bearings on tugs, motorboats and launches.

Sludge Remover Cleans Fuel-Oil Tanks

All industries that use fuel oil are troubled with sludge collecting in the bottom of storage tanks and pipe lines. A product has been developed which, it is claimed, will clean up this sludge when added to the fuel, thereby eliminating carbon at the burners. The treatment is simple, and the quantity of sludge remover necessary is small, about 1 lb. of remover to 400 gal. of oil for each treatment. It is said that the use of this material not only prevents the formation of sludge, but that, as a consequence, the consumption of fuel is reduced, and smoke practically eliminated at the furnace or stack.

Tool Drills at Any Angle and Has Positive Feed

In places where compressed air or electricity are not available or power cannot be used, a universal hand drill now on the market will be found very effective, and much more convenient than the old ratchet drill and "old man." The drill has a clamp formed integral with the base, so that it can be attached to the work without bolts, and the swivel head has three positive adjustments that enable drilling to be done at any angle. The tool can be operated by either crank or ratchet, and is made in three sizes, accommodating drills from ¼ to 1¼ in. The spindle may be furnished for taper or straight-shank drills. On work where holes must be drilled in awkward positions this drill will prove of value.

Revolving Cutter Trims Wood without Crushing

Using a revolving knife, a new trimmer cuts perfectly smooth and straight edges on wood without crushing the fibers. The

The Wood Fibers Are Not Crushed When This Revolving-Knife Trimmer Is Used

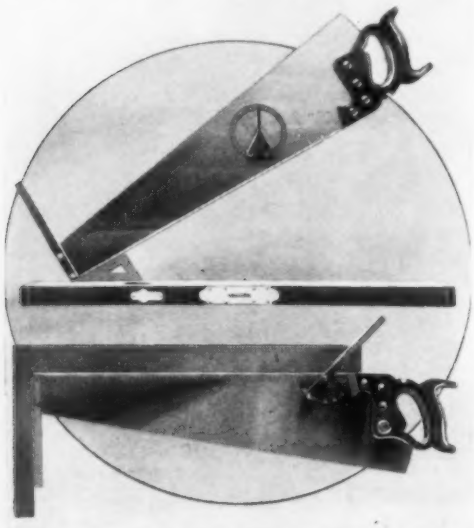
total cutting surface of the knife edge is 16½ inches, and any angle up to 45° may be cut by setting the guides on the machine. To make setting easy, the 45, 60, and 90° positions are marked on the base.

Oil Gauged with Steel Tape

Made to meet the demand for a reel tape for gauging the heaviest oils, a new steel tape will stand severe usage. The tape ribbon is ½-in. wide, and is mounted in a strong nickelplated frame. The drum is cored for lightness, and is about 2⅝ in. in diameter, which, with the long winding handle, gives increased leverage and makes the tape easy and quick to operate. The winding handle folds either to right or left, making it possible to lock the tape at any desired length, and the knob folds neatly against the frame. The plumb bob is 1 in. in diameter, 6¼ in. long and weighs 18 oz.

Saw Combines Miter, Square, Protractor and Level

Combining in one tool a saw, rule, square, miter and bevel gauge, protractor and level, and inclinometer or angle gauge,



Above, Saw Tilted to 30° from Horizontal; Below, Showing Try-Square and Protractor Attachment

a new handsaw should prove a welcome addition to the tool chest of either the professional woodworker or the handy man.

Close to the handle is pivoted an arm which forms a protractor, with a pin at one end fitting into holes drilled in the saw on a graduated arc. Simply by snapping the arm from one hole to another, angles of 30, 45, 60, 67½ and 90° may be obtained; intermediate angles are determined by means of the graduations, and the arm is locked by tightening the pivot pin. By attaching the arm to the end of the saw, a try-square is formed. The shanks of the pins are tapered so as to take up any wear that may develop, and to retain the accuracy of the tool over a long period of use.

The gravity level or inclinometer attachment is mounted on the opposite side of the saw, and swings over a circle graduated to full 360°. This not only allows the tool to be used as a plumb and level, but also to indicate any pitch or angle, and is especially useful for roof or stair work. The back of the saw is graduated in inches and sixteenths to serve as a rule, thus further increasing its usefulness.

Lubricant Saves Saw Blades; Reduces Time and Labor

Hacksaw lubrication has long been a problem to users, but a lubricant has recently been developed that bids fair to solve the problem.

The lubricant is made at present in paste form, and it is said that one application to a blade is sufficient for a day's work. Tests have shown that the new mixture not only reduces appreciably the cutting time and labor, but also prolongs the life of the blades to a remarkable extent. One indirect benefit of the use of the lubricant is in the saving made in the quantity of oil usually consumed. This, where hacksaws, either hand or power, are used, amounts to a quantity totally unsuspected by the user; as so little of the paste is required, it proves to be a decided economy, besides helping to keep the work and shop clean. The lubricant is also good for bearing scrapers, drills, milling cutters, etc., and the advantages mentioned when the paste is used with hacksaws apply with equal force when used with other metal-cutting and scraping tools.

Automatic Action Features One-Cable Clamshell

Dredging contractors and construction engineers will be interested in a new clamshell that works entirely on one cable, opening and closing automatically. The engineer simply winds in the cable until the bucket is at the dumping height, swings the boom around until it is in the dumping position, then slacks the cable a little, and the bucket discharges. Swinging the boom back, he then lowers the bucket, which remains open until it touches the material to be lifted, when it automatically sets itself for closing. It is said that this bucket is of especial advantage in underwater operations, as the operator cannot close it until it reaches the material to be raised to the surface.

RADIO

Broadcasts Chorus of 1,000 Voices from Eastern Station

The annual concert of the Albany Community Chorus was recently broadcast by station WGY of Schenectady and was highly appreciated by the radio audience, as was evident from the numerous letters received from every part of the country. The transmitting station was connected with the hall in which the concert was given by means of telephone lines, a method which was also used to broadcast President Coolidge's voice through a Chicago station while he was speaking in Washington a few months ago. This is the first time that such a large chorus has been heard by means of radio.

Baseball Officials Use Radio

President Veeck of the Chicago Cubs surprised a number of his players recently when they dropped into his office and found him seated before a radio set. It was not there for amusement purposes, however, as he informed them that radio was going to play an important part in keeping him in touch with the doings of the team in future, when they were out of town, either in training or playing in other cities. Weather reports and play-by-play dispatches from out-of-town games should make the set a profitable investment for any progressive baseball-team manager.

Copyright, Underwood & Underwood

President Veeck and Manager Killefer of the Chicago Cubs Check Up on the Team by Radio

Theatrical Star Listens In on Brief-Case Set

Dorothy Stone, daughter of Fred Stone, and co-star with him in his latest play, has joined the ranks of the vast army of radio

Miss Dorothy Stone with Her Radio Set, Which Fits in a Brief Case

fans, and fishes for distant stations nightly in her dressing room, between acts.

As may be noted from the illustration, the set she uses—a one-tube receiver—is an exceptionally compact one; in fact, it fits easily in an ordinary brief case. In spite of its unusual size and design, stations as far away as Hastings, Neb., and Davenport, Ia., have been tuned in with it in the theater in New York.

¶Glass dials and knobs for the radio set are the latest. The graduations and figures on the dials are molded into the glass, thus, it is claimed, eliminating all danger of static leakage and insuring that the lines will not be worn off in use. The glass, of course, is an excellent insulator and is moisture-proof, so that the dials cannot warp in service.

Take Receiving Set Along on Auto Tours

L. J. Miller, of Brooklyn, N. Y., does not believe in doing without his usual

Weighing Only Nine Pounds, This Set Adds Much to the Enjoyment of a Long Auto Trip

radio concert when on an automobile tour with his wife. He takes his set along.

The receiver weighs only 9 lb., complete with batteries and head phones, and operates on a 7 by 10-in. loop antenna, so that he need not spoil the appearance of his car by stringing an antenna over the top. The loop is built right into the cabinet of the set, and the instrument will receive stations within a radius of 25 miles in the city, and about 50 miles in the country. A portable set of this character is ideal for campers and tourists, as it adds little weight and bulk to the luggage to be carried in the car.

Message Takes Less Power than Flashlight

With only one-thousandth of the power required to light an ordinary battery flashlight similar to those used in nearly every home, C. D. Maclurcan, an amateur radio experimenter in Sydney, Australia, has succeeded in transmitting radio signals 1,400 miles. His signals were picked up readily in New Zealand. This is regarded as a marvelous record, far surpassing low-power work of American amateur operators.

Experimenters in Australia, especially in the cities, are allowed only 10 watts of power, hence more attention has been given to power there than in other countries. Mr. Maclurcan has made a special study of this problem and the distances covered by his amateur station, 2CM, are regarded as a world's record.

He has made several tests, usually with witnesses present to check him on the results obtained. At one time he exchanged messages with Frank Bell, operator of station 4AA of Waihemo, Shag Valley, New Zealand, over land and water for half an hour. Mr. Maclurcan gradually reduced his plate voltage to 15, thereby securing a plate current of .25 mil. amp. The input was only .004 watt. As the result of these experiments, he believes that low power can be used for commercial purposes at a great saving. His set is to be installed soon on a ship, when the commercial advantages of low power will be determined.

Radio Set Fits in Thimble

What is claimed to be the smallest radio set in the world has been made in Washington, D. C. The entire set fits into an ordinary thimble. Considerable ingenuity is manifested by the builders of sets of this kind, in the winding and fitting of the coils, detector, etc., and the results are usually interesting, if not especially useful. Our photo shows Henri Slaughter, the builder

Radio Set Built in Thimble Being Used by Maker to Hear President's Speech

of this set, listening in on President Coolidge's speech, which was recently broadcast from New York.

¶ Don't apply more than the specified voltage to the plates of tubes.

Movies in Home, Forecast of Inventor

The Heart of the New Radio Motion-Picture Receiving Apparatus

The Inventor, C. Francis Jenkins, Demonstrating the Radio Motion-Picture Camera; with This Device, Movies May Soon Be Enjoyed in the Home

A Contrast between His First Motion-Picture Projector, Invented by Mr. Jenkins in 1893, and the Essential Parts of the Radio Movie Machine, Which Is Rapidly Being Perfected by the Inventor

Radio in Auto Helps Sell Real Estate

There have been plenty of radio-equipped automobiles but perhaps none quite so neat, or so unusual in purpose as

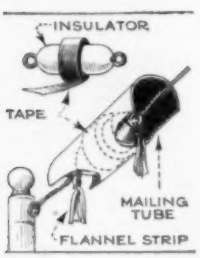
Realtor Uses Radio Set to Aid in Selling Bungalows

that shown in the photo. A five-tube neutrodyne set is built to fit behind the dashboard with the dials within convenient reach of the driver. The aerial is concealed in the top of the car, and the car battery supplies the current for the tubes. Either a headset or a concealed loud speaker under the hood can be used.

This set is owned by an enterprising real-estate salesman in Los Angeles, who uses it to convince prospective purchasers that the house or lot he is endeavoring to sell them is in a good location for radio reception. The owner says that it really does help to sell bungalows.

Preventing Aerial from Grounding in Heavy Rains

One has often heard the assertion that the set works better in a rainstorm than at any other time. This, of course, is very largely untrue. The reception may be as loud, but there is interference because in a hard rain the aerial is to some extent grounded. The flow of water, or at least the dampness, carries energy from the aerial over the wet insulator and down the soaked rope or dripping wire to the ground by way of a thoroughly dampened tree, pole or house. I minimized this interference in my own mind for some time, but finally hit upon a scheme to overcome it. I said nothing until I had equipped my aerial and given it a trial. A heavy rain then proved its worth, for after enjoying wonderful results throughout the storm, I hauled down my aerial to find the insulator perfectly dry, and therefore functioning perfectly. All that is necessary is to obtain a cardboard mailing tube, about 2½ in. in diameter, and cut it so there will be about 2 in. projecting past each end of the insulator when the tube is slipped over it. Then wrap ordinary bicycle tape around the middle of the insulator until the tube will just fit over it. Before putting the tube in place, tie a strip of flannel in each ring or hole at the ends of the insulator, to drain off any water that may run along the wire. Then cut away about 2½ in. from the bottom of each end of the tube, paint the tube with several coats of heavy lead paint and put it in place.—C. N. Bourgholtzer, New York, N. Y.



Compact Variable Grid Leak Has Wide Adjustment

A variable grid leak which has an exceptionally wide range of adjustment and is at the same time a very small and compact unit has been developed by a Chicago radio laboratory. This unit consists of a bakelite shell, or case, within which is mounted a carriage holding graphite points, which are made to travel up and down by means of an adjusting screw. The graphite points make a broad mark on the inside wall and thereby furnish the leak for the grid circuit. One of the binding posts on the outside is connected to this path while the other is connected to the carriage. The adjusting screw, with a thumbnut on the end, makes a fine adjustment possible.

Entertain Theater Patrons before Show

Seatholders are now being entertained by radio during the period of waiting for the curtain to rise in a London theater. Arrangements were made with the broadcasting company to install loud speakers in the auditorium, and then the time-honored balcony and gallery queues were abolished, the public being admitted at 6:45 p.m. From 7 to 8 p.m., the concert broadcast by station 2LO whiles away the long wait. There are two loud speakers, one on each side of the gallery, and an inside aerial, 50 ft. long, is stretched across the auditorium near the roof.

Miss Pola Negri Listens In on Her Receiving Set on the Left. In the Center Is Frank McIntosh, Assistant Operator of WOAW, and at the Right, Miss Helen Hann, One of WEAF's Announcers, Who Also Delights Fans with a Clear Soprano, Singing in the Studio

Radio Artists Feel Lack of Applause

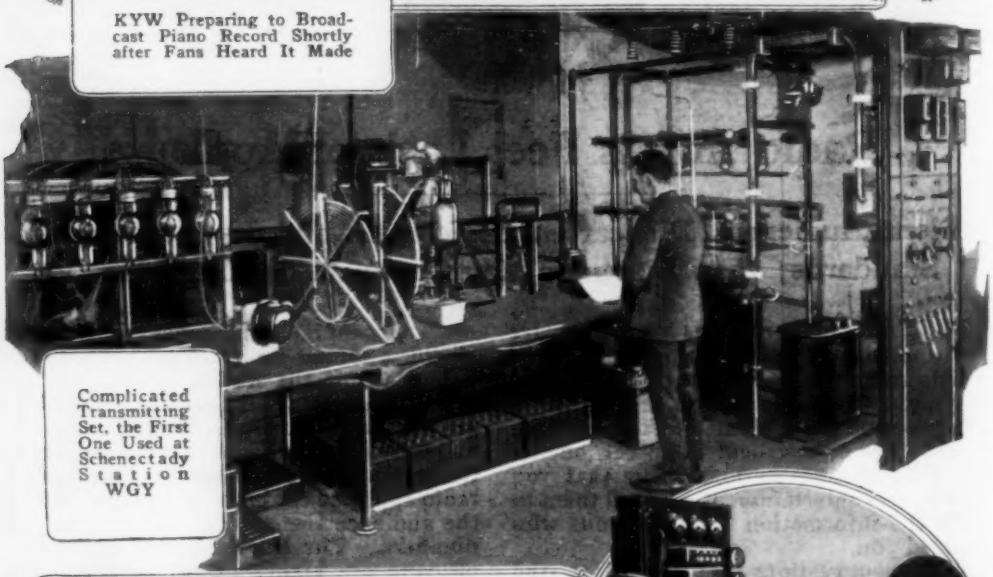
Silent Audiences Dishearten Performers and Lower Program Standards; How Listeners May Cheer Unseen Entertainers

BETTER radio programs by giving more applause to the performers. Let the artists know that you like their singing and playing. Just because you are getting a fine program for nothing, don't give all the credit to your excellent radio set, but let the broadcasting stations know that you enjoy their entertainment, and tell them to relay the information to the persons who amused you.

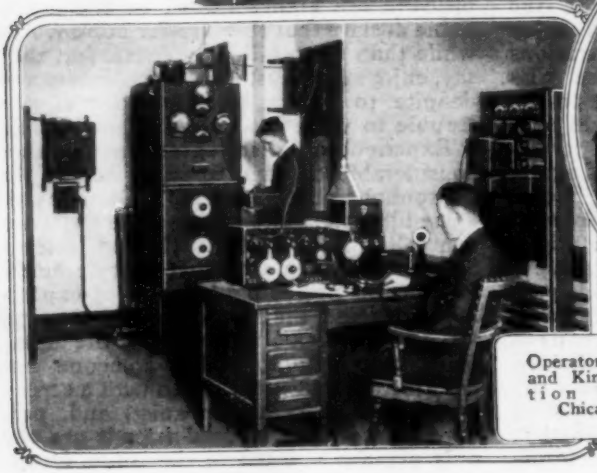
These suggestions are offered to the nightly audience of millions who enjoy programs from the broadcasting stations throughout the country by those who realize the importance of applause to the artists. The performer who receives only silence as his reward is not likely to improve his work or offer his services again. It is no easy task to stand before a microphone and sing or talk to a blank wall, and, contrary to popular opinion, stations are having great difficulty in getting talent of sufficiently high standard for their programs. Those who have studied the situation say that there is grave danger that radio programs will steadily decline in quality unless the audience realizes its responsibility in the matter, and does what every audience is supposed to do—and is usually eager to do—applauds the performers. Of course, the conventional hand clapping cannot be heard by the artist as he steps from the studio. If it could, the radio fan's task would be easy. But there are always postal cards, letters, telegrams and telephone messages that can be sent to the stations and to the performers. Lately, radio applause cards have appeared to help the audience register its comment on the numbers. These written expressions of pleasure are highly valued by the artist. Some declare that they are far more worth while than the audible applause, for, they say, enjoyment must have been sincere and definite to inspire the fan to take the trouble to write his note of appreciation.

Experienced artists agree that it takes considerable courage to stand before the microphone and "perform." Ominous silence fills the studio room. The walls are generally hung with thick and solemn drapes to deaden all unnecessary sounds. In place of bright lights, rows of expectant faces and the friendly orchestra, the artist sees only a blank wall and the tantalizing microphone, which someone has described as "a little dishpan with a screen across it." The accompanist, and, perhaps, one or two favored friends are the only persons allowed in the room, in ad-

KYW Preparing to Broadcast Piano Record Shortly after Fans Heard It Made



Complicated Transmitting Set, the First One Used at Schenectady Station WGY



Operators Weller and Kimball, Station WMAQ, Chicago

Chief Operator J. N. Nassau at Transmitter, Station WOO, Philadelphia

"G. R.," Gene Rouse, Announcer at WOAW, Developed His Voice While Acting in Stock

President of the "Truth Tellers" at WBAP

Meet Miss M. L. Casey Who Edits the Programs Broadcast from Westinghouse Station KYW, Chicago

E. F. MacDonald, Jr., at Microphone of Station WGN, Formerly WJAZ

Carl Jester, Mrs. William J. Cramb, Kolin Hager, Robert Weidaw, Asa O. Coggeshall and Edward H. Smith, Announcers at Station WGY

Putting Dramatic Action across the Ether at Station WGY as Players, Assisted by Sound-Producing Properties, Broadcast Scene from "The Great Divide"

Behind the Scenes at Station KYW, Joe Lamie and Hert Mentz Indulge in a Few High Jinks in the Studio

Miss Mary Vogt Playing Selection on Wanamaker Organ at Station WOO

Tom Brown and Julian Eltinge at WLW

Mary Garden before the Microphone at Station WMAQ, Chicago

© U. & U.
Anton Lang, the "Christus" of the Oberammergau Players, Speaks to the World from Station WGN, Chicago

Group of Artists and Staff of Directors Who Are Responsible for Programs from Crystal Studio, Station WGN, Chicago

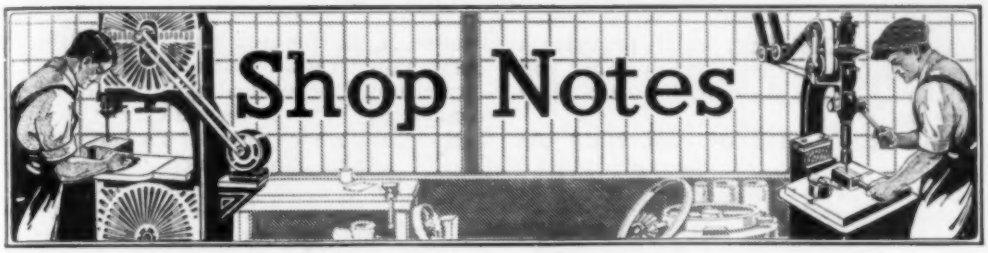
dition to the director, and the performer "steps from the stage" with no burst of gratifying applause ringing in his ears. Then, if no letters or comments of any kind are received a day or two later, he concludes that he was a failure.

Instances of stage fright are common in broadcasting, and sometimes the listeners are able to picture the plight of the performer. Maj. John J. Fanning, director of station WNAC, tells of a professional reader who had started a brisk program of selections with a recitation of "Gunga Din." He was a man of wide experience before audiences, but the microphone seemed to embarrass him. Suddenly, he forgot his lines. "I left the switch in, hoping that he would come to," Maj. Fanning explains. "A minute or two passed, then he began to sweat. The switch was still in and suddenly he blurted out, 'Gosh, I'm licked.' I couldn't switch him off quick enough. He told it to the whole world and everyone who happened to be listening in heard him."

That response is not difficult to obtain from the radio fan is seen in the success of an experiment performed not long ago by stations KYW, WDAP and WJAZ, all of Chicago, in trying to find out what sort of programs were best enjoyed. For twelve days, these stations sent out the same question, asking for choice of numbers as part of their programs. They received a total of 263,410 pieces of mail in reply during that period. As it was estimated that not more than one in fifty listeners replied, the number indicated an audience of at least 13,000,000 persons. The results of the question were illuminating. Twenty-nine per cent of those replying expressed a preference for popular music; more than twenty-four per cent were anxious to hear classical numbers, and straight "jazz" was favored by only eighteen per cent, while the saxophone received less than one per cent of the votes and band music about three.

Artists and stations value unfavorable criticisms also, for many of them are constructive and are based on facts. Again, "roasts" are sometimes received unsigned, and these are given scant attention. However, artists declare that they are less annoying than hisses and the sterner expressions of disapproval occasionally received on the stage. As most of the performers receive no remuneration, they feel entitled to replies of some sort from their audience, for by these alone can they gauge the success of their efforts. Reports from various broadcasting stations, the distribution of applause cards and the increasing interest of listeners throughout the country in good programs indicate that the nightly audience of radio fans, when once the importance of applause to the artists and to themselves is realized, will not neglect their responsibility in responding to the distant voices that entertain them.

Morgan L. Eastman, Director of KYW, Reading a Small Stack of Mail from Radio Fans; Center, L. W. Chansky, Engineer of WOAW, and Right, the Response to WOAW's Request for a Ballot on Its Programs



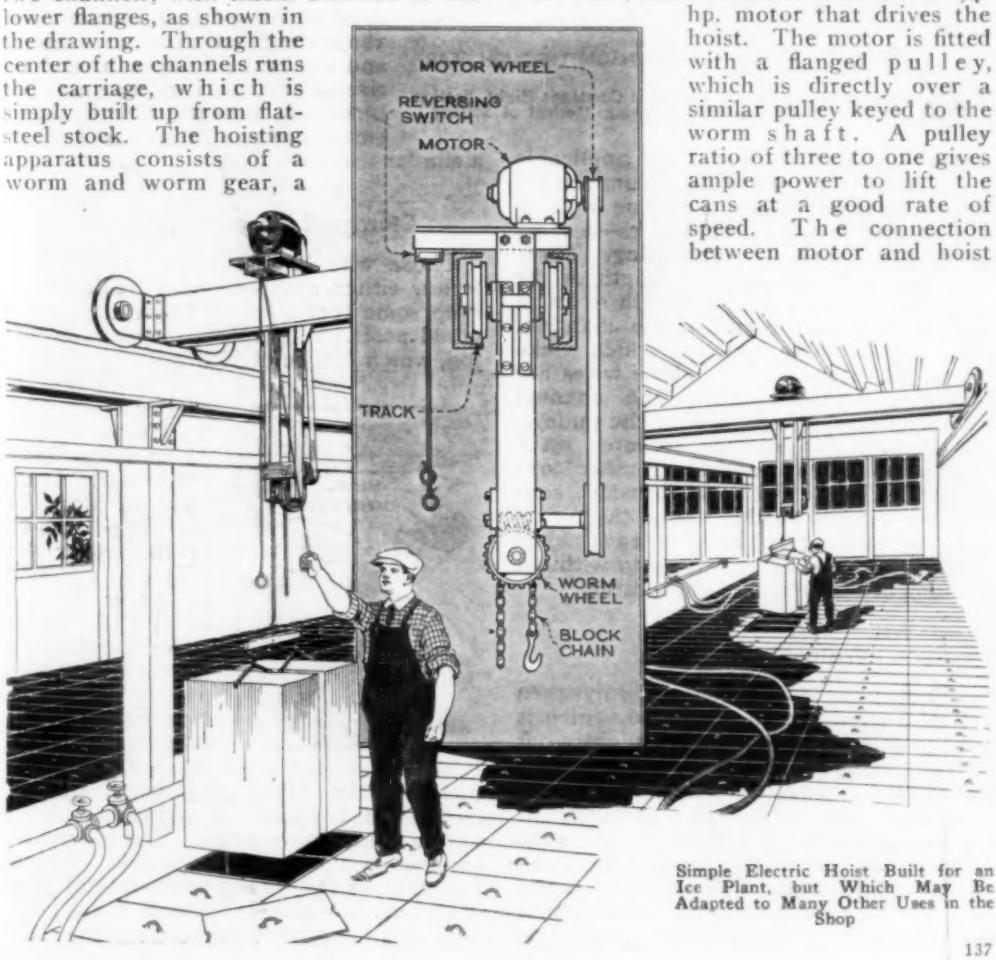
All Shop Notes published in 1923, in book form—Fifty Cents—from our Book Department

Making a Small Electric Hoist

By J. V. ROMIG

THE electric hoist described in this article was designed for a small ice plant, to speed up and lighten the work of pulling the ice cans out of the tanks, but the same type of hoist can be used for many other purposes.

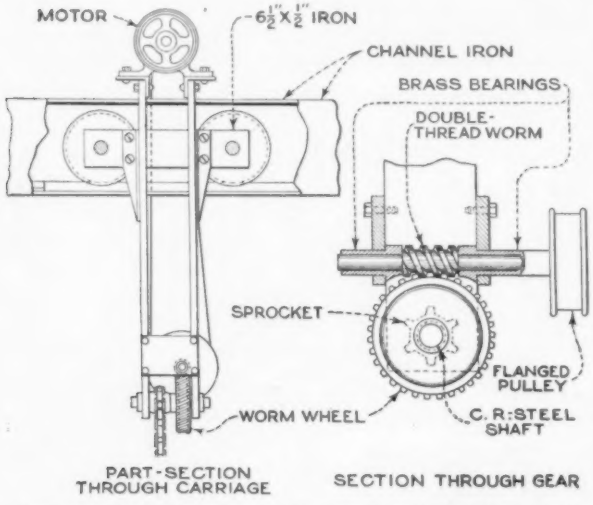
The cross frame of the hoist is made of two channels, with tracks screwed to the lower flanges, as shown in the drawing. Through the center of the channels runs the carriage, which is simply built up from flat-steel stock. The hoisting apparatus consists of a worm and worm gear, a sprocket and a length of block chain. The gear and sprocket are keyed to the same shaft, the latter running in brass bushings carried in the carriage side members. The worm is pinned to a shaft at right angles to the gear shaft. On the projecting tops of the carriage side members two angles are bolted, and to these is fastened the ¼-hp. motor that drives the hoist. The motor is fitted with a flanged pulley, which is directly over a similar pulley keyed to the worm shaft. A pulley ratio of three to one gives ample power to lift the cans at a good rate of speed. The connection between motor and hoist



Simple Electric Hoist Built for an Ice Plant, but Which May Be Adapted to Many Other Uses in the Shop

is made by a 2-in. belt, which provides a safe and powerful drive, but one that will slip should a can stick in the tank when being pulled.

While the method of connecting the motor to the power line is not applicable in all cases—nor can it be recommended for use in places where some one is likely to come in contact with the wires—a short description may prove interesting. Three wires are stretched the full length of the track, and a short vertical length of angle iron is fitted to the end of the channels. This carries three brushes, which make contact with the wires. Three wires are similarly stretched along the channel frame, on the opposite side to the pulleys, and three roller brushes mounted on a bracket bolted to the carriage make contact with them. From the brushes, connection is made to the motor, through a reversing switch; two handles are attached to the latter, and extend down to within a convenient distance of the operator.



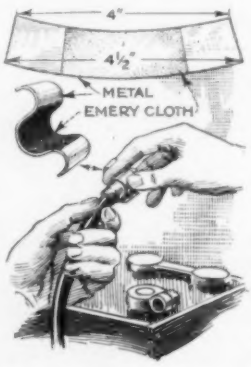
Details of Motor Mounting and Trolley of Carriage; Right, Section Through Worm-Shaft Bearings, Showing Method of Fitting

Truing Brake Bands

A brake band works efficiently only when the total friction area is utilized, which is not the case when the band is slightly out of true. A good method of truing up external brake bands is to first mark on a large piece of wood having a perfectly flat surface, a circle with a radius equal to the radius of the brake drum plus the thickness of the brake lining. This circle must not be made by running the pencil along the edge of the brake drum with the lining laid around it, as this not being perfectly circular would result in inaccuracy, but the circle should be scribed by means of large compasses. The circle indicates the correct circumference of the inner edge of the brake band, which is then laid over it and compared with it. In many cases the lower edge of the band will not touch the surface of the board at all points and this is the first defect to be corrected. After the band has been made to lie flush on the board it is laid with its inner edge on the circle and the portions where it departs from the true line are carefully noted. These are bent inward or outward until the band is perfectly true to the circle. A small square is then set up against the side of the band to see if it is also true across its width; if not, it must be twisted until square. The correctness of the band should be carefully checked by going through the above-described operations again, and the brake lining can then be riveted on, taking care not to throw the band out of true again. Internal brake bands are trued in a similar manner.

Storage-Battery Post Cleaner

Those who handle many storage batteries, either automobile or radio, must keep some tool at hand to clean the terminal posts. A simple little tool for this job, which can be carried in the pocket or the tool box, is shown in the drawing and can be made at very small cost. Cut a piece of metal to the shape shown in the upper detail; this should be about 1½ in. wide, and curved as indicated. Now rivet or cement a piece of coarse emery cloth to one side, rough side out. Bend the metal in the shape of a cone, slightly larger than the posts, then bend the ends out to form finger grips. The emery, of course, should be on the inside. To use the tool, slip it over the post, and grasping it between the fingers, tighten it and turn back and forth until the post is clean.

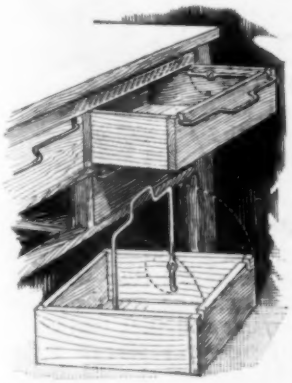


Eliminating Static in Camera

In film cameras, particularly motion-picture cameras, it sometimes happens that static sparks occur within the cameras, ruining the film. This is likely to happen especially in cold, dry weather. In taking some photos in a large electric power house, an entire roll of films was ruined in this way before the trouble was discovered. As a means to eliminate the static, the metal frame of the camera was grounded. This was done by means of a flexible copper wire attached to the camera and to the ground, and the result was as anticipated—no more trouble.

Combined Drawer Pull and Handle

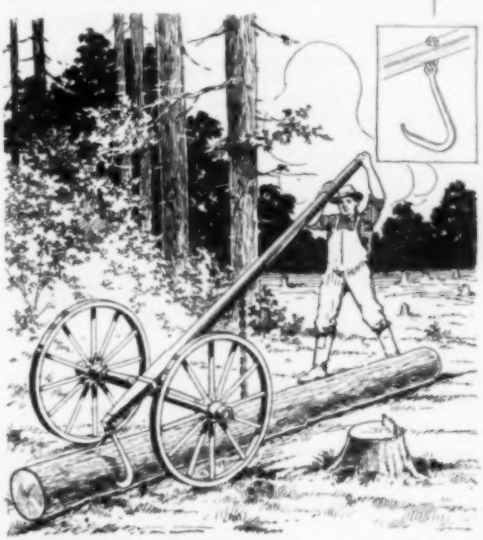
A combined drawer pull and handle is a novel feature on workshop drawers which was found useful by a Wisconsin mechanic. A length of ½-in. iron rod was bent to the shape shown and attached to the sides of the drawer in the inside at the center, slots being cut in the front of the drawer to receive the rod when the drawer is slid under the bench. Two shallow ½-in. holes are drilled directly under the screws on which the handle pivots, to catch the ends of the rod when it is set up for use. These ends are, of course, rounded to prevent cutting a groove in the side of the drawer.



Truck for Handling Logs

When short logs, telephone poles or even sections of large water mains must be moved short distances and the use of horses is impossible or unprofitable, a serviceable truck of the kind shown in the drawing, will prove worth the time required to construct it.

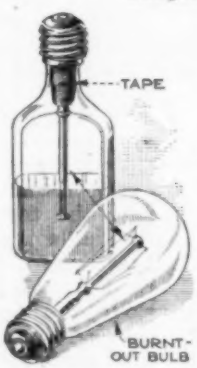
It consists of the wheels and axle of a light wagon and an ordinary wagon tongue mounted across the axle to serve as a lever. At the short end of the tongue a pair of steel tongs are suspended to swing freely in any direction. The truck is loaded by pushing it in the position shown with the axle near the center of the log to be carried. The lever is raised so that the tongs grip the log and is then pulled down, raising the end of the log above the ground. A length of chain, attached to the tongue as shown, is then passed around the log and one of its links caught over a hook on the side of the tongue. For handling small, straight logs, a hook, made as shown in the detail, can be used instead of the chain.—G. E. Hendrickson, Argyle, Wis.



Handy Truck for Transporting Short Logs, Telephone Poles and Sections of Large Water Mains

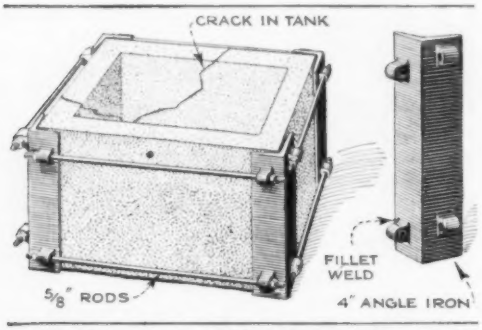
Simple Iodine Swab

The glass rod of a burnt-out electric lamp makes an excellent iodine swab. The bulb of the lamp is broken off and the wires carefully removed, those at the end of the rod being bent back and forth until they break. If sharp edges still project these should be filed down. Ordinary tape, or better still, rubber tape, a piece of which can be obtained at any electrician's shop for a few cents, is wrapped around the glass rod near the base to form a stopper. The base is left on to serve as a handle.—F. D. Brooks, Toledo, Ohio.



Repairing Concrete Tank

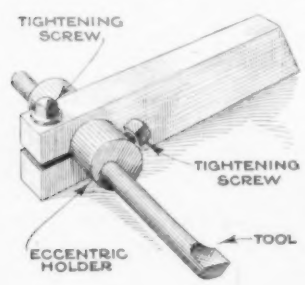
Concrete tanks often crack in the manner shown in the illustration, which makes it necessary to replace them with new ones. However, in one case where the tank was in constant use and making a new one meant too long a delay, an effective and permanent repair was made by filling the crack with neat cement and then clamping all four sides together as indicated. Four corner pieces were made of 4-in. angle iron, which were just as long as the tank was deep. To the sides of these angles were welded lugs, consisting of 2-in. pieces of 1½-in. cold-rolled steel drilled for ⅝-in. rods; the rods were threaded at both ends and fitted with nuts, to permit drawing up the corner pieces tightly.—A. S. Jamieson, Springfield, Mass.



Cracked Concrete Tank Effectively and Permanently Repaired by Clamping Sides Together

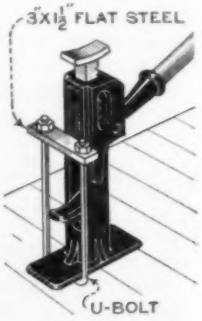
Small Boring-Tool Holder

With the ordinary boring-tool holder, held in the toolpost in a position parallel to the direction of cut, it is necessary not only to adjust the tool centrally, but also to clamp it in a position parallel to the lathe bed each time it is placed in the toolpost, after sharpening. Otherwise the tool is liable to bear on the end of the hole being bored and thus push the point of the tool away from the cut. A boring tool held in the holder illustrated is always parallel, the adjustment being made after the holder is tightened in the toolpost by moving the eccentric around and tightening both screws. This holder is made from ⅞ by 1½-in. stock, drilled and reamed for a 1-in. hole, after which the front end is slit and tapped for a tightening screw. Next, a piece of 1-in. cold-rolled rod is drilled with an eccentric hole to take the boring tools and a hole is drilled at right angles to this and tapped for a tightening screw which holds the tool. Both tightening screws should have the same size head to facilitate handling. Only the round tool is removed for sharpening, the holder remaining in the toolpost.



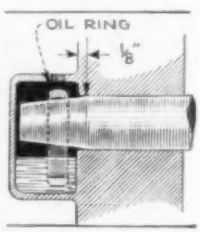
Jack Acts as Arbor Press

Having some rush work to do when the regular arbor press was out of order we rigged up one of our heavy-duty jacks as shown in the illustration to serve as an emergency arbor press. A U-bolt with a flat crossbar across the ends was hooked under the base of the jack as indicated. The bolt was made of ¾-in. round stock, with the ends threaded for a length of about 8 in., and the crossbar was a piece of flat steel 3 in. wide and 1½ in. thick. A short piece of flat steel was laid on the foot of the jack and the work—in this case a connecting rod that had to be fitted with a bushing—was placed on it. By raising the jack so that the work was pressed against the crossbar the bushing was forced into place.—Frank N. Coakley, Buffalo, N. Y.



Improving Bearing Lubrication

The lubrication of a small bearing on a high-speed motor was improved considerably by turning the end of the shaft down to a taper. The taper extended ⅛ in. inside of the bearing to give the oil free access to its inner surface. When the shaft is rotating, the ring tends to climb up the taper, and upon touching the side of the bearing, feeds it with oil. Before tapering the shaft the bearing ran hot frequently, but since this was done the trouble was entirely eliminated.



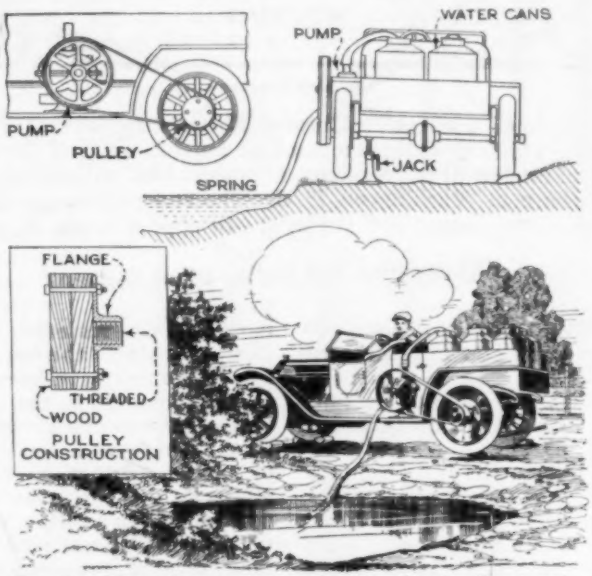
Pumping Water with Light Truck

By J. V. ROMIG

DURING a drought in the eastern states, a farmer was caught without any water for his stock, his cisterns all being dry. Some two miles distant, however, was a roadside spring, which ran strongly all the time, and he decided to haul his water from this source with his truck. Milk cans were used to carry the water, but he soon found that filling these by hand was a very arduous task, also that it consumed considerable time. He therefore looked around for a quicker and easier way.

A gear pump, found in a local plumber's shop, was bolted on the running board of the truck. The hub cap of the left rear wheel was removed, and a small wooden pulley, fitted with a threaded flange, screwed onto the extending threads of the axle.

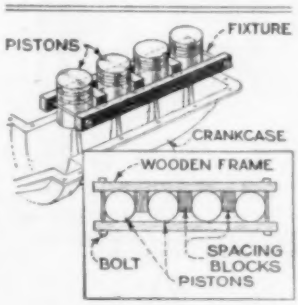
When the spring was reached, he would jack up the left rear wheel, and throw on the emergency brake, which only gripped the right wheel, as the left side was temporarily disconnected. A ½-in. belt was then placed on the wheel and pump pulleys, and the clutch let in. A length of hose, attached to the suction side of the pump, was thrown into the spring, and the discharge hose placed in each of the cans in turn, until all were filled. Upon arriving at home, the suction hose was placed in the cans, and the discharge hose in the open top of his cistern pump.



Pumping Water from a Spring with the Aid of a Truck and a Plumber's Gear Pump, During a Drought

Replacing Cylinder Block

When overhauling automobile engines it is an easy matter to pull the cylinder block off the pistons, but it is a difficult task to get it back in place again, as the pistons usually tumble over in every direction. However, by the use of the simple fixture shown, this work becomes comparatively easy. The fixture consists of two lengths of wood held together at the ends by bolts. A number of small spacing blocks are screwed to one of these to hold the pistons properly alined and spaced. The device is well worth making in a garage where repairing is largely confined to one type of car, and, in larger shops, it might pay to make such fixtures for several different engines.—G. A. Luers, Washington, D. C.

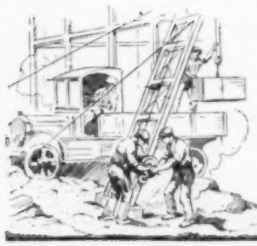


Serviceable Welding Goggles

On small jobs the worker with an acetylene torch usually dislikes to put on heavy goggles due to the difficulty of seeing the work clearly, but working without them is a severe strain on the eyes. For such cases a special pair of goggles can be made by removing the glasses from another pair, grinding off about a third of the upper part and then reinserting them in the frame. For setting up and adjusting the work, the operator looks over the top of the lens, but when using the flame he looks through the glass as usual.—Harold E. Benson, Boulder, Colo.

MECHANICAL POWERS

By CARL W. MITMAN
Curator
DIVISIONS OF MINERAL AND MECHANICAL TECHNOLOGY
UNITED STATES NATIONAL MUSEUM



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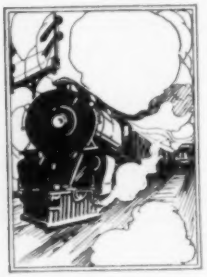
This is the fifth article of a series by Curator Mitman, explaining in simple language what every man who builds or designs a machine must know, and showing in detail just how to build a set of models of the mechanical powers that will exactly duplicate the set in the National Museum at Washington, D. C. The first articles appeared in the March, April, May and June issues, and the next will appear in the August number.

Part V—Pulleys and Pulley-Block Systems

WHILE the applied forces and resisting forces encountered in levers are quite easily discerned, and, therefore, easily analyzed, the same cannot be said of a more complicated mechanism such as a locomotive. This does not alter the fact, however, that the lever and locomotive are basically the same, in that each is an arrangement of parts in an apparatus by which force is transmitted from one point to another, generally with some modification of its intensity or direction, and resulting in the performance of mechanical work. Both function under the principle of work, and in each the principle of moments applies equally. In the case of the lever, however, the relationship of the contending forces is that of a small applied force and a great resisting force, while in the case of the locomotive a great applied force is used to move a small resisting force.



As a matter of fact, the use of any machine is to adapt the applied forces to the resisting forces. This adaptation is brought about solely by the construction and arrangement of the parts composing the machine and the almost endless varieties and types of machines illustrate the ingenuity with which applied forces have been regulated, modified and adapted to the varying conditions and requirements of the resisting forces. Thus, wherever a small force is required to move a great resistance; where a force acting in one direction is required to impart motion in another or a velocity greater or less than its own; where a force having reciprocating motion is to produce continuous motion, or one having rectilinear motion is required to produce circular motion—in all these instances, a machine can be obtained or designed which will modify the effect of the applied force in the desired manner.

The simplest form of pulley is that of a grooved wheel turning within a frame to which a hook, eye or strap is fastened. To do work, a rope is fitted into the grooved wheel, and the "block," as it is then called, is attached to some object by means of the hook or strap. This simple block has no mechanical advantage except that which may arise from its ability to change the direction of the pull of the applied force. Whatever force is exerted at one end of the rope is transmitted without increase or decrease (except from friction and the rigidity of the rope) to the resisting force at the other end. This is quite evident from the fact that the machine is nothing more than

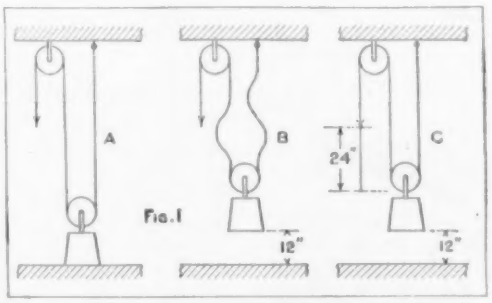


Diagram Illustrating How the Mechanical Advantage of a Pulley-Block System May Be Ascertained

a revolving lever of the first order with the fulcrum midway between the applied and resisting forces, and therefore in equilibrium or balance.

From the foregoing it will be seen that to gain mechanical advantage and therefore to constitute a mechanical power, more than one pulley must be used. The simplest of such combinations is that shown at A, Fig. 1. It will be observed that one pulley is attached or fixed to a support and the other is movable and has the resisting force or load suspended from its axis. One end of the rope is also attached to the support, passes under the movable pulley and over the fixed one. By this arrangement it is plain that the load is supported equally by the supporting beam and the applied force. But the fixed pulley does nothing more than permit the applied force to be directed downward so that, except for this advantage, it may be disregarded in the matter of work performed. Now, to raise the load 12 in., as shown at B, it is plain that each side of the rope around the movable pulley must be moved 12 in. This means that the applied force acting at the free end of the rope must then move downward 24 in., that is, the applied force acts through twice the distance traveled by the load or resisting force, as at C. Therefore, by the principle of

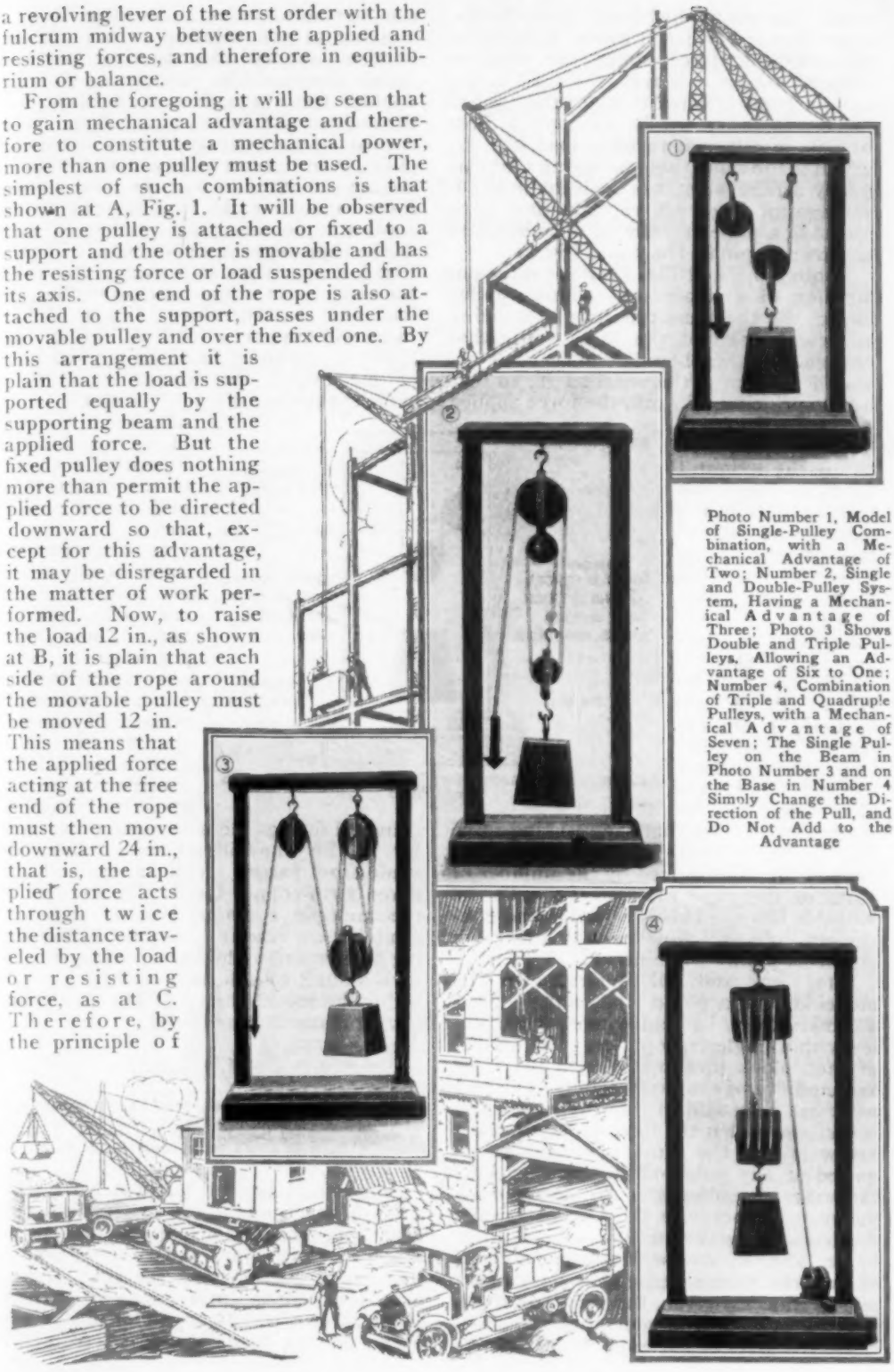
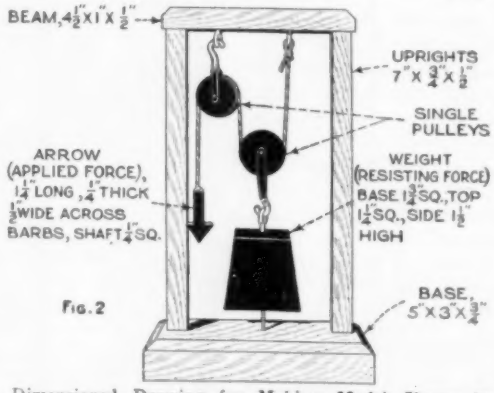


Photo Number 1, Model of Single-Pulley Combination, with a Mechanical Advantage of Two; Number 2, Single and Double-Pulley System, Having a Mechanical Advantage of Three; Photo 3 Shows Double and Triple Pulleys, Allowing an Advantage of Six to One; Number 4, Combination of Triple and Quadruple Pulleys, with a Mechanical Advantage of Seven; The Single Pulley on the Beam in Photo Number 3 and on the Base in Number 4 Simply Change the Direction of the Pull, and Do Not Add to the Advantage

work, that the applied force times the distance through which it moves must equal the resisting force times the distance through which it moves, the load in the case in point is equal to twice the applied force. In other words, an applied force of 1 lb. is sufficient to lift a load of 2 lb., which is the same thing as saying that this pulley arrangement has a mechanical advantage of two. A reproduction of a model of a pulley system of this character is shown in photo No. 1 and Fig. 2.

Photo No. 2 and Fig. 3 represent a combination of a single and a double-pulley block. By the same process of reasoning as before, each of the three ropes that engage the movable pulley must be shortened 1 ft. to raise the weight 1 ft., so that by the principle of work, the force applied at the arrow will have to move 3 ft. to lift the weight 1 ft. Accordingly this combination has a mechanical advantage of three. From these two examples it is evident that whatever the arrangement or number of pulleys, the weight that can be raised can be calculated by observing the relative distances passed through by the applied force and resisting force; also, that the resisting force that can be overcome is always equal to the applied force multiplied by the number of parts of the rope that engage with the movable block. This is a simple and convenient rule to follow in calculating the power of pulley combinations.


BEAM, 4½" X 1" X ½"
UPRIGHTS 7" X ¾" X ½"
SINGLE PULLEYS
ARROW (APPLIED FORCE), 1¼" LONG, ¼" THICK ½" WIDE ACROSS BARBS, SHAFT ¼" SQ.
WEIGHT (RESISTING FORCE) BASE 1¾" SQ., TOP 1½" SQ., SIDE 1½" HIGH
BASE, 5" X 3" X ¾"
Fig. 2

Dimensioned Drawing for Making Model, Shown in First Photo

The block and fall illustrated by the model shown in photo No. 3 and Fig. 4 is a combination of a double and a triple pulley with a single draw pulley. The pulleys of each block turn freely upon the same axis and are of the same diameter. From what has been said of the single pulley, it is easily seen that the force required at the arrow is just the same as would be required at any point of the rope between the movable pulley and the single draw pulley. Furthermore the load is equally divided among the pulleys of the lower block, and, of course, among the parts of the rope passing around them, so that by the rule just given, the mechanical advantage of this arrangement is six, there being six parts of the rope which engage the movable pulley. Another way of arriving at the solution of the relation between applied and resisting forces in pulley systems is by considering that the applied force produces a uniform pull throughout the length of the rope. Each part of the rope engaged with the movable pulley is in tension in an amount equal to the applied force so that the total upward force supporting the load is equal to the applied force times the number of parts of the rope supporting the load. Thus in Fig. 5 it is evident at a glance that there are seven parts of the rope supporting the load and that therefore 1 lb. of applied force will support a load of 7 lb., or that if 350 lb. are to be lifted, an applied force of one-seventh that weight, or 50 lb., is sufficient to do the job. The single pulley attached to the base of the model in Fig. 5 permits a change in the direction of pull of the applied force.

In constructing these models of pulley systems, standard pulleys may be used. They may be purchased in various styles suitable for this work from makers of model ship fittings. However, should the constructor be unable to obtain standard fittings, he may make them similar to the ones illustrated. These are made from turned metal pulleys and soldered strip-copper faces. In the case of the multiple combination, the large assemblies are readily built up by alternating pulleys and pulley faces, connecting all with a shaft of sufficient length.

For the model shown in Fig. 2, the following material is required:

Base, 5 by 3 by ¾ in.
Two uprights, 7 by ¾ by ½ in.
Beam, 4½ by 1 by ½ in.
Two single pulleys.
Weight (resisting force), base 1¾ in. square, top 1½ in. square, side 1½ in. high.
Arrow (applied force), length 1¼ in., ¼ in. thick, ½ in. wide across barbs, shaft ¼ in. square.
Necessary cordage.

Square and face all wooden parts with a finish bevel on the top of the base and beam. Secure the uprights to the ends of the beam with glue and brads. Center this frame on the base, securing it with glue and screws from beneath. Attach small screweyes to the underside of the beam, one on each side, ¾ in. from the

pillars. Hook a single pulley to the left-hand screweye. Hook the other single pulley to the screweye used as a handle for the weight. Fasten an end of a cord, about 10 in. long, to the remaining beam screweye. Reeve it under the weight pulley and over the hanging pulley, attaching the end to the arrow by gluing it in a hole drilled lengthwise in the shaft. Secure the arrow and weight in their proper positions by invisible brads. Finish as desired.

For the single and double-pulley model shown in Fig. 3, use the following material:

Base, 5 by 3 by ¾ in.
Two uprights, 10 by ¾ by ½ in.
Beam, 4½ by ¾ by ½ in.
Single pulley.
Double pulley.
Weight (resisting force), base 1¾ in. square, top 1¼ in. square, side 1½ in. high.
Arrow (applied force), length, 1¼ in., ¼ in. thick, ½ in. wide across barbs, shaft ¼ in. square.
Necessary cordage.

Square and face all wooden parts with a finish bevel on the top of the base and beam. Insert a small screweye in the center of the underside of the beam. Fasten the uprights to the base with glue and screws from beneath. Fasten the beam across the uprights, securing it with brads and glue. Hook the double pulley into the eye on the beam. Hook the lower pulley to the weight. Insert an end of the cord in a hole drilled lengthwise in the arrow. Reeve the cordage over one wheel of the large pulley, under the wheel of the lower pulley, over the second wheel of the

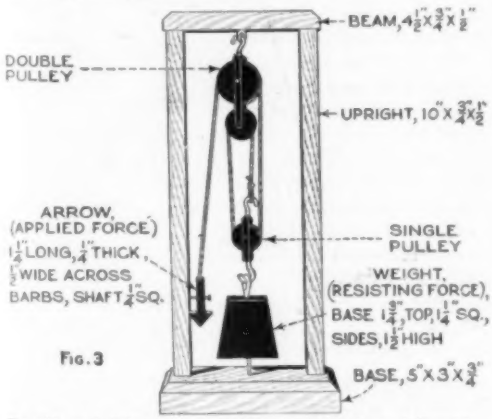

BEAM, 4½"X¾"X½"
DOUBLE PULLEY
UPRIGHT, 10"X¾"X½"
ARROW, (APPLIED FORCE) 1¼"LONG, ¼"THICK, ½"WIDE ACROSS BARBS, SHAFT ¼"SQ.
SINGLE PULLEY
WEIGHT, (RESISTING FORCE), BASE 1¾"SQ., TOP, 1¼"SQ., SIDES, 1½"HIGH
BASE, 5"X3"X¾"

Fig. 3

Details and Dimensions of Model of Single and Double-Pulley System

large pulley and attach it to the top hook of the lower pulley, as shown in photograph. Retain the weight and arrow in their correct position by invisible brads. Finish as desired.

For the model shown in Fig. 4, the following materials are required:

Base, 6½ by 4 by ¾ in.
Two uprights, 10 by ¾ by ½ in.
Beam, 6¼ by 1 by ½ in.
Single pulley.
Double pulley.
Triple pulley.
Weight (resisting force), base 1¾ in. square, top 1¼ in. square, side 1½ in. high.
Arrow (applied force), 1¼ in. long, ¼ in. thick, ½ in. wide across barbs, shaft ¼ in. square.
Necessary cordage.

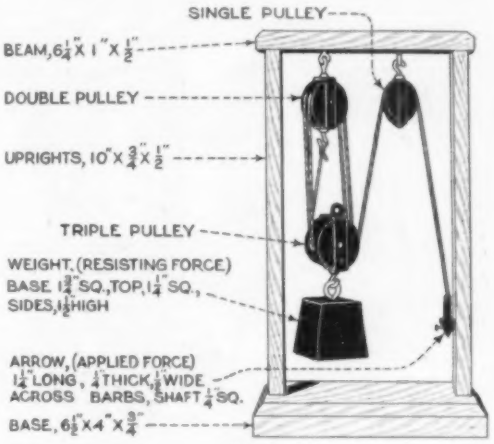

SINGLE PULLEY
BEAM, 6¼"X 1"X ½"
DOUBLE PULLEY
UPRIGHTS, 10"X ¾"X ½"
TRIPLE PULLEY
WEIGHT, (RESISTING FORCE) BASE 1¾"SQ., TOP, 1¼"SQ., SIDES, 1½"HIGH
ARROW, (APPLIED FORCE) 1¼"LONG, ¼"THICK, ½"WIDE ACROSS BARBS, SHAFT ¼"SQ.
BASE, 6½"X4"X¾"

Fig. 4

Construction Details for Model of Double and Triple-Pulley System

Square and face all wooden parts with a finish bevel on the top of the base and beam. Secure the two uprights to the ends of the beam with glue. Attach this frame to the base, securing it with glue and screws from beneath. Attach two screweyes on the center line of the underside of the beam and 1½ in. from each pillar. Hook the single pulley to one screweye and the double pulley to the other. Hook the triple pulley to the screweye used as a handle for the weight. Attach an end of the cord to the lower hook of the double pulley and reeve through corresponding wheels of the double and triple pulleys, carrying the end from the triple-pulley wheel over the single pulley and gluing it in a hole drilled lengthwise in the arrow shaft. Retain the arrow in its proper position with an invisible brad. Finish as desired.

For the model in Fig. 5, the following materials are necessary:

Base, 6 by 4 by ¾ in.
Two uprights, 10 by ¾ by ½ in.
Beam, 5½ by ¾ by ½ in.
Four-sheave pulley.
Three-sheave pulley.
Single pulley.
Weight (resisting force), base 1¾ in. square, top 1¼ in. square, side 1½ in. high.
Arrow (applied force), 1¼ in. long, ¼ in. thick, ½ in. wide across barbs, shaft ¼ in. square.
Necessary cordage.

Square and face all wooden parts with a finish bevel on the top of the base and beam. Insert a screweye in the center of the underside of the beam. Fasten the

ends of the beam to the uprights with glue and brads. Secure this frame to the center of the base with screws and glue. Attach the four-sheave pulley to the beam eye. Attach the three-sheave pulley to the screweye used as a handle for the weight.

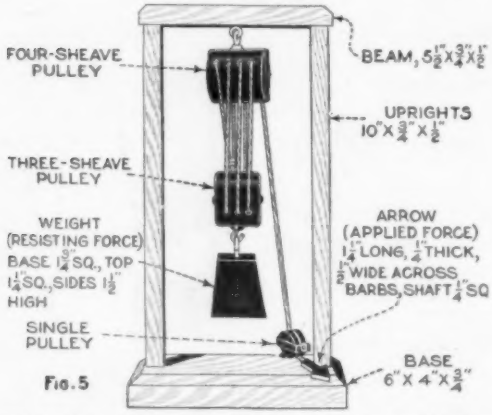

FOUR-SHEAVE PULLEY
BEAM, 5½"X¾"X½"
UPRIGHTS 10"X¾"X½"
THREE-SHEAVE PULLEY
WEIGHT (RESISTING FORCE) BASE 1¾" SQ., TOP 1¼" SQ., SIDES 1½" HIGH
ARROW (APPLIED FORCE) 1½" LONG, ¼" THICK, ⅜" WIDE ACROSS BARBS, SHAFT ¼" SQ
SINGLE PULLEY
BASE 6"X 4"X¾"

Fig. 5

Dimensions and Details of Model Showing Combination of Three and Four-Sheave Pulleys

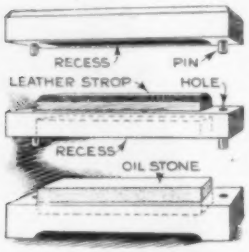
Fasten the end of cord to the upper eye of the three-sheave pulley and reeve alternately through the upper and the lower pulleys, attaching the free end to the arrow by inserting the cord in a hole drilled lengthwise in the shaft. Finish as desired.

In the photograph illustrating this model a direction-changing single pulley is used. This is not necessary for mechanical advantage, being only an illustration of a possible convenience.

(Continued Next Month)

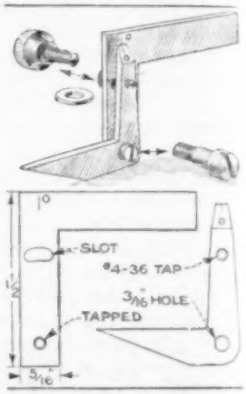
Dirtproof Oilstone Box

In general practice oilstones are usually kept in a plain box with a piece of leather nailed on the cover. When honing, the cover is laid down wherever most convenient—often in dirt and grit—with the result that some dirt gets on the stone when the cover is put on again. The exposed leather strop is also a place where dirt and grit are liable to collect, and the sharp edge of a tool or knife will quickly be ruined when using a dirty strop. The illustration shows an oilstone box designed to eliminate this trouble. It consists of three parts: a holder for the stone, a holder for the strop and a cover. The lower section is recessed to hold the stone and the center piece is recessed to fit over it. A leather strop is mounted neatly on a piece of wood of the same size, which is screwed on the middle section and the cover is recessed to fit over this piece loosely. Two 5/32-in. holes, about ½ in. deep, are drilled in each section as shown, and ⅛-in. metal pins are provided to fit into these holes.



Auxiliary Finger for Height Gauge

In selecting lines on jigs from which to locate other lines, more or less trouble is encountered by not being able to get an exact measurement, owing to the stiffness of the height gauge. I therefore made the scriber shown in the illustration, which gives very good results. It is made in two parts, connected by means of a small screw. To set the scriber, the thumbscrew is released so that the pointed end can work freely. The sharp point is inserted into the line and the head of the gauge raised or lowered until the two zero lines meet; the thumbscrew is then tightened, leaving the scriber parallel and the center of the line located correctly. The remaining measurements are taken from the graduations on the height gauge. The drawing gives the dimensions and shows how the tool is assembled.—Fred A. Dufresne, Riverside, Rhode Island.



Turning Piston on Centers

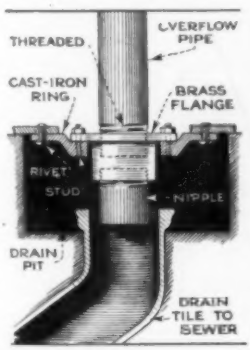
When machining a gasoline-engine piston in a small lathe, which was not equipped with a chuck large enough for this kind of work, the following method was adopted: A piece of scrap iron of irregular shape was placed inside of the piston, and lead was poured in the space between it and the piston wall, to make a solid mass. It was then an easy matter to mount the piston in the lathe between centers in the usual way, and the work of turning it was easily accomplished.—Harold N. Sellan, Peterboro, Can.

Taking Up Play in Crankcase Bearing

When the front crankcase bearing on the frame of a Ford car wears and the motor begins to pound as a result, a quick method of making a repair without using new parts is to cut a piece of thin sheet steel wide enough to fit between the flanges on the bearing spool and long enough to wrap around it one or more times, depending on the amount of wear. The cap is removed and the front end of the motor with the crank is lifted high enough to pass the strip under the bearing spool. The cap is then replaced and the cap screws tightened down. If the cap will not come down on the frame, too much metal has been used and in this case the cap is again removed and part of the strip unwound and cut off. —E. T. Gunderson, Humboldt, Ia.

Novel Drain Installation

With the customary method of fitting a drain flange in the bottom of a water tank it is necessary to take down the whole installation in case the drain tile becomes clogged. This objectionable feature is entirely eliminated by the novel construction shown in the drawing. A recessed cast-iron ring is riveted to the underside of the tank bottom and in this ring studs are provided to hold a brass flange into which the overflow pipe is screwed. A short nipple on the end of this pipe projects into the drain tile leading to the sewer. One can readily see how easy it is to remove the overflow pipe when a thorough cleaning is necessary. Furthermore, the cast-iron ring, being below the tank bottom, allows the tank to be completely drained, which is impossible when it is attached to the upper side.



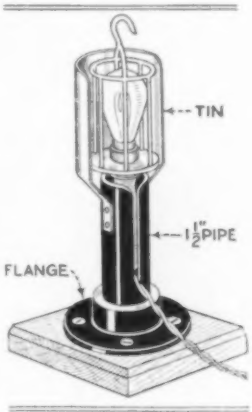
Low Cart for Stenciling Rolls

In a carpet factory, a low cart with a padded seat, ball-bearing casters, and a shelf on one side, is used by the workman who stencils or labels the rolls of carpet. The cart, built especially for the purpose, is just high enough for the worker to sit on comfortably when applying the stencil, the shelf on the side holding the brush, paste, paint, stencils and labels so that they need not be carried from one roll to the next. Obviously, the work can be done much faster this way than if the worker has to stoop down or get on his knees in front of every roll.

Low Cart Facilitates Work of Stenciling and Labeling Rolls of Carpet

Support for Portable Lamp

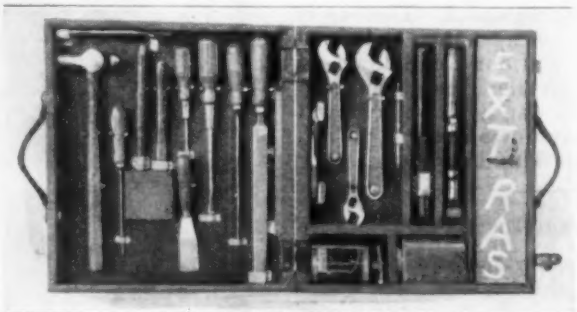
The ordinary portable garage lamp is provided with a hook on the end of the wire guard so that it can be hung up conveniently. However, when working underneath a car the lamp can not always be hung up so that the light is thrown on the work and therefore it is usually laid on the floor. A much better method is to provide a simple support of the kind shown for holding the lamp under the work. It is made from a 6-in. length of 1½-in. pipe, slotted as shown to receive the lampcord, and screwed into a floor flange, which, in turn, is securely screwed to a wooden block about 6 in. square. A tin reflector is riveted to the support to shade the light from the worker's eyes.



Convenient Farm-Tool Kit

Tools for all ordinary repairs on farm machinery can be conveniently carried in the small kit shown in the photo, according to agricultural experts of a western college of agriculture who designed it. Besides being easily portable—the complete outfit, including all the tools, weighs only about 24 lb.—it has the advantage of being so arranged that the omission of any one tool will be noticed immediately.

The kit can easily be made by anyone handy with tools. The outside dimensions of the box are 17 by 15 by 4½ in. Its two halves are hinged at one side and two hinged hasps are provided on the other for locking. This side also has two 7-in. leather handles for carrying, one on each half. The material is ½-in. lumber except for the bottom, in which ¾-in. is used to provide sufficient thickness for the hinges.



A Neat and Compact Tool Kit for the Farmer; It Weighs Only 24 Pounds Including All Tools

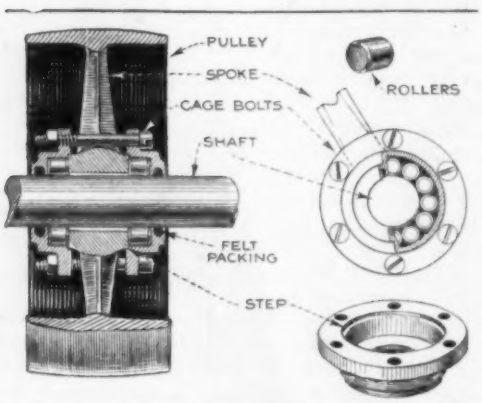
The tools are held in place by spring clips, so that any one of them can be removed and replaced without disturbing the others. This arrangement tends to prevent loss of tools.

The hinges, hasps and spring clips are all standard pieces that can be obtained at any hardware store. The guards for the ends of the files, chisels and screwdrivers, and the keepers for the rule, pliers and calipers are easily made of galvanized iron.

A compartment measuring 3½ by 1¾ by 17 in. provides space for extras, such as bolts, nuts, washers and cotter keys. This is closed with a sheet-iron cover, which is divided in the center, hinged at each end and fastened in the middle by a loop and cotter key. This cover is essential in order that none of the contents may be lost when the kit is closed.

The tool equipment consists of 1-lb. ball-peen hammer; 6-in. slender three-cornered file; 8-in. round file; 10-in. mill file; 6-in. screwdriver; 3-in screwdriver; putty knife; 7 by ⅝-in. chisel; 8 by ⅝-in. punch; 6 by ⅜-in. punch; 8-in. double calipers; 3-ft. four-fold rule; 6-in. slip-joint pliers; 6-in. crescent wrench; 8-in. crescent wrench; 10-in. crescent wrench; 14-in. pipe wrench; 12-in. monkey wrench; 8 oz. oilcan; grease can.

Both oil and grease cans should have screw tops. The opening in the grease can should be large enough to admit the blade of the putty knife, which can be used conveniently for filling grease cups.—M. L. Coultrap, Fresno, Calif.



Roller Bearings Fitted to Pulleys Reduce Wear and Friction

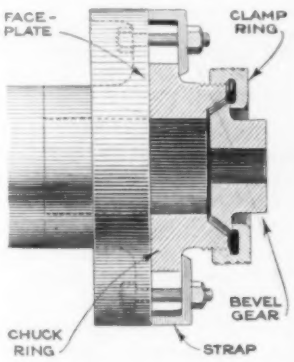
Roller Bearings for Loose Pulleys

Pulleys that run loose on a shaft and wear out their bushings quickly due to heavy or tight belts can be fitted with roller bearings to eliminate this trouble; this will also reduce friction. The hub of the pulley is bored out, or in case it contains a bushing, this is knocked out, and the sides of the hub are then turned down to fit the roller cages. These are made of steel or cast iron, turned and drilled as indicated, then slipped over and bolted in place on the hub. Each cage contains its own single row of rollers, and a packing groove is turned in each cage, in which a ring of soft-felt packing is placed; this retains the oil or thin grease that is fed to the cavity in the center of the hub by an oil or grease

cup. The outer faces of the cages are machined to bear against the collars used to prevent end motion. The rollers are made of low-carbon tool steel, turned, hardened and drawn to a brown color, then ground to size. Six or eight can be turned in one piece and notched so as to be broken apart easily after grinding. The rollers must have beveled edges as shown in order to run freely in the raceways and should all be of exactly the same diameter and length.—J. V. Romig, Allentown, Pa.

A Bevel-Gear Chuck

Small bevel gears with cast teeth are easily ruined if they are chucked in a regular lathe chuck for boring, or facing, and the time consumed in chucking makes some simpler method highly desirable. Where quantities of such gears are to be machined it will be economy to make the chuck shown in the drawing. A chuck-ring casting of the form and shape illustrated is machined and fitted to the lathe faceplate and is then bored and tapered to a nice fit for the face of the gears. The beveled face conforms to that of the gears and the internal diameter should permit of sliding the hubs in easily. The outside of the fixture is then threaded and onto this is screwed the threaded clamping ring, the narrow flange of which bears against the back of the gear and holds it firmly in place during the machine operations. For use with small gears, the clamping ring can be pulled up tightly enough by knurling the outer face of the clamping ring, but a spanner must be used for large work.



Lamps Show if Factory Machinery Is Working

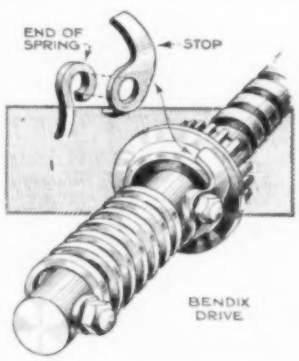
In a canning factory having seven food-packing machines the manager has installed a little device near his desk to indicate whether or not all seven are working properly. The device consists of a panel on which seven miniature lamps are mounted, each of which is connected to one of the machines, so that every time a can passes to the filling machine it causes a lamp to flash. As long as the lamps keep

Flashing Lamps near Manager's Desk Indicate Whether Factory Machinery Is Working Properly

flashing, the manager knows that everything is going well, but if any lamps fail to flash it is a signal to him that he is perhaps needed in the factory to untangle some difficulty. A switch is, of course, provided so that the current can be turned on or off.

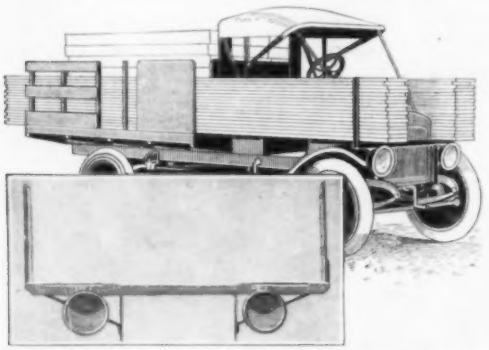
Preventing Sticking of Starter Pinion

Occasionally a Bendix-drive gear will stick in mesh and will not release after the engine has been started. In most cases this trouble can be prevented by providing a small stop on the end of the spring as shown in the illustration. The stop is cut out of heavy sheet metal, drilled and bolted to the end of the spring, and bent to conform to the curvature of the flange on the pinion. A small lug must be provided on the head of this stop to fit into the eye of the spring in order to prevent the stop from turning on the screw that holds it. It is then casehardened to keep it from being battered. The stop strikes the weight on the flange of the gear and prevents jamming of the pinion.—Ralph T. Stewart, Statesville, N. C.



Steel Rack for Lumber Trucks

Trucks used for carrying lumber can be made much more useful by providing a steel rack in front of the radiator, as shown

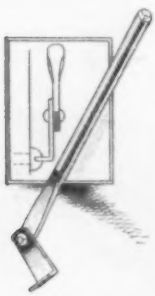


Steel Rack Attached on Front of Motor Truck Permits Carrying Long Lumber

in the drawing. By this means very long planks and timbers can be carried without extending behind the truck farther than a normal load. The rack is made of square iron rod and is bolted directly to the truck frame. If the headlights interfere with the rack, they may be removed and brazed to the rack itself, as shown. This arrangement has been found entirely satisfactory.

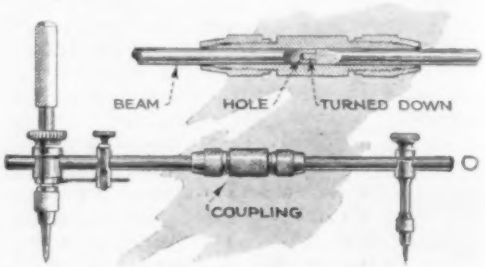
Tool for Adjusting Internal Brakes

On many internal brakes there is a small screw inside the drum at the rear of the brake, which cannot be turned with any ordinary screwdriver, as the head of the screw can scarcely be touched with the finger after the small plate on the drum has been removed. It is therefore usually necessary to remove the wheel and take apart the whole assembly in order to make this single adjustment, and this, of course, is undesirable. However, the brake adjustments can be made quickly and without the necessity of taking the wheel off, by using the simple tool shown in the illustration. It is a hinged, offset screwdriver and has been found entirely satisfactory for use on the Cadillac. It is inserted through the small opening in the drum, so that the lip engages one of the slots in the screw head. Turning the wheel down a trifle while holding the end of the tool, causes the spokes to press against the handle, and this will move the screw about one-eighth of a turn. Then by striking on the end of the screwdriver with a hammer the screw can be moved another eighth turn, or one-fourth turn in all. As the two slots in the screw head are at right angles, the second slot will now be in position to be engaged by the lip, and the above-described operation is repeated until the screw has been tightened.—J. E. Dekker, Chicago, Ill.



Improving Joint of Double-Beam Compasses

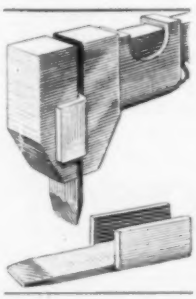
When two beams are used in beam compasses they have a tendency to rock slightly due to the construction of the joint, and this, of course, causes the distance between the points to vary. This trouble can be eliminated by drilling a hole in the end of one beam and turning down the end of the other to fit the hole snugly. This joint will connect the beams solidly and prevent the undesired rocking.



Improved Joint on Beams of Compasses Prevents Rocking

Handy Screwdriver Attachment

For driving or removing heavy screws an attachment for an ordinary monkey wrench, made as shown in the illustration, has been found to be of considerable usefulness. It is formed from a piece of tool steel about 1/16 in. thick, cut and bent to the shape shown, with the edge ground down and tempered. The attachment is especially handy for loosening screws that are rusted in place. The leverage obtained is much greater than that of an ordinary screwdriver, and therefore care must be taken not to twist off the head of the screw when trying to loosen it.



ETCHING GLASS

By J. S. Hagans

HYDROFLUORIC acid has the rather unusual property of attacking glass and silicates in general. It is about the only chemical that will attack glass, and beyond this its use is very limited. This feature of hydrofluoric acid makes it of particular value in the decoration and ornamentation of glass without recourse to mechanical processes, such as sandblasting or grinding. The latter processes have the merit of speed and cheapness, but for a number of purposes the acid cannot be displaced, particularly if there is any shading to be done. Another peculiar feature of hydrofluoric acid is that both the acid itself and its fumes attack the glass. Direct contact with the acid leaves the glass clear, while exposure to the fumes leaves a frosted effect, which, however, is not particularly bright. Hydrofluoric acid is not difficult to make, but manufacture is inadvisable because of the risk of burns, and it cannot be overemphasized that this acid is poisonous, and produces bad burns on contact with the skin, wherefore it is recommended that rubber gloves be worn when handling it, and that a breathing mask be worn, or, at least, the work should be done under a laboratory hood that carries off the fumes.

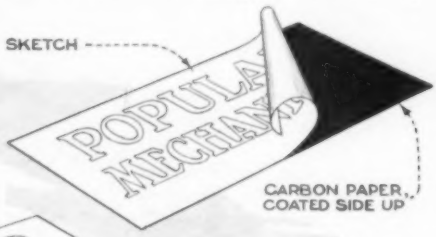


Fig. 1

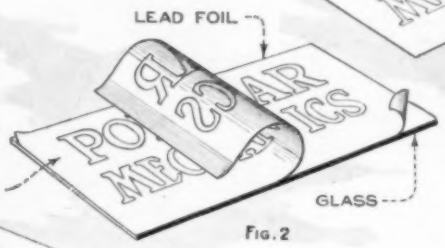


Fig. 2

Method of Transferring Design to the Waxed Surface of the Lead Foil

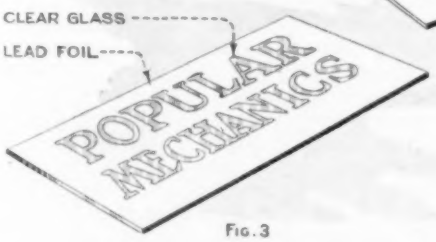


Fig. 3

Naturally the acid cannot be kept in glass or earthenware containers, but is supplied in lead bottles. While the acid itself is comparatively cheap, its price is increased somewhat by the cost of the lead containers. Powerful as is its action on glass, hydrofluoric acid cannot cut grease or wax, and for this reason it is possible to use wooden trays and metal dippers for handling the acid, provided they are thickly coated with beeswax; lead trays, of course, are also unaffected by it.

Based upon the above-mentioned properties of the acid, several processes have been worked out for its practical use, chief among them its application to what is generally known as "glass embossing," principally used in the monogramming or decoration of glass, either in relief or intaglio, depending upon the effect it is desired to obtain. Being unaffected by the fluid and its fumes, beeswax can be used to make an effective "resist"; if the decoration is to stand out above the surface of the glass, it is only necessary to block out the design with wax, and for intaglio work, to use the lead-stencil method described in the article on sandblasting published in the March, 1923, issue, which is preferable. This consists in warming the glass, applying a little beeswax, and then, while the wax is still warm, rubbing a piece of lead foil into absolute mechanical contact. The design is cut out in this. The design may be transferred to the foil by first laying it out on paper, then laying the design on car-

bon paper, coated side up, as in Fig. 1, and going over it with a hard pencil or stylus. The sketch is then laid on the foil, which has also been covered with beeswax, and rubbed down with the bowl of a spoon or other rounded metallic object; when the sketch is peeled off, as in Fig. 2, the carbon lines will have been transferred to the waxed surface of the foil, which can then be cut out, as shown in Fig. 3. After cutting the stencil, it is advisable, when etching by acid, to wipe off the design with soda water, or in the case of fine work,

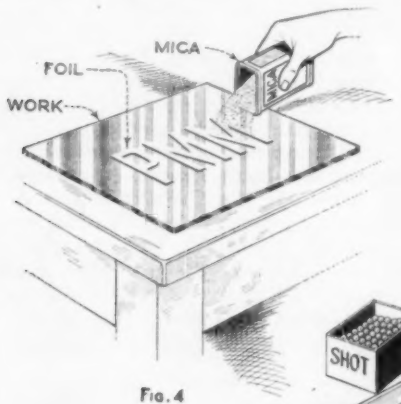


Fig. 4

Producing a Mottled or Pitted Background by Means of Flake Mica or Shot

with castile soap dissolved in gasoline, to remove any wax that does not adhere to the foil.

As mentioned previously, use of the straight acid leaves a clear glass and this process is used when working with "flashed" red or blue glass, in which the color is only on the surface. Using the acid to remove the thin skin of color that may be on either one or both sides of the glass, the effect of clear glass against a strong blue or red background is obtained.

Another particularly good effect is an "antique finish" that gives the glass a mottled appearance, somewhat similar to that of hammered-copper articles. This result is obtained by blocking out the parts it is desired to remain unaffected by the acid either with wax or lead foil and then sprinkling the rest with ground mica, or the artificial "snow" used on Christmas trees, as in Fig. 4. The particles of mica will cause the surface of the glass to be pitted when the acid is applied, an effect that is particularly pleasing for such purposes as leaded-glass windows, panels for table lamps and similar uses. This effect can be varied by using lead shot or gravel in the same manner, as illustrated in Fig. 5. If shot is used, the effect is considerably more regular; this feature can be utilized to good advantage for some purposes. A similar but better effect is obtainable by using gravel of any desired degree of coarseness in the same manner. There is one objection to the use of gravel, however, and that is its weakening effect on the acid. Ordinarily the acid can be used repeatedly until it loses its strength. However, since practically all gravels contain a considerable proportion of silica, the latter is attacked in the same way that the glass is itself.

Now we come to the use of "white" acid. The plain acid leaves a clear etching, and the frosting obtained by exposure to the fumes is unsatisfactory. However, by the use of the so-called white acid it is entirely possible to get any degree of frosting desired, and to regulate the effect in such a manner that, in the case of monograms and similar work, all the letters can be given a different value. White acid is prepared by mixing full-strength hydrofluoric acid, ½ pt.; carbonate of soda, ½ lb., and water, 1 pt. Only clear crystals of the soda should be used and the white-powder residue should be discarded. The crystals may be crushed to hasten the action. The pure acid, while dissolving the surface, has the effect of leaving it clear, but when modified or neutralized by the action of an alkali, as in the white acid, it produces a dense white frosted surface. By varying the strength of the white acid, that is, by increasing or diminishing the amount of water, and by regulating the time allowed for the etching, almost any variation in shading can be obtained. For example, in etching a monogram on a door panel, it is desired that each of three initials be distinct from the others. This can be done by etching one letter at a time and blocking out the others as the work goes on, as shown in Fig. 6. The full strength of white acid may be used for frosting the first letter. For the second letter, the acid is diluted with water and the time allowed for etching reduced, and so with the third letter. Ornamental de-

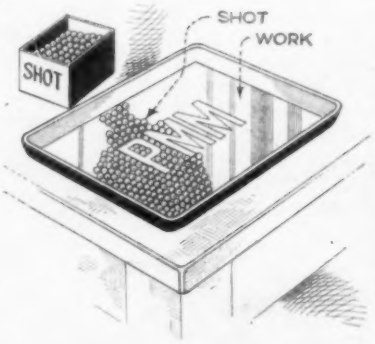
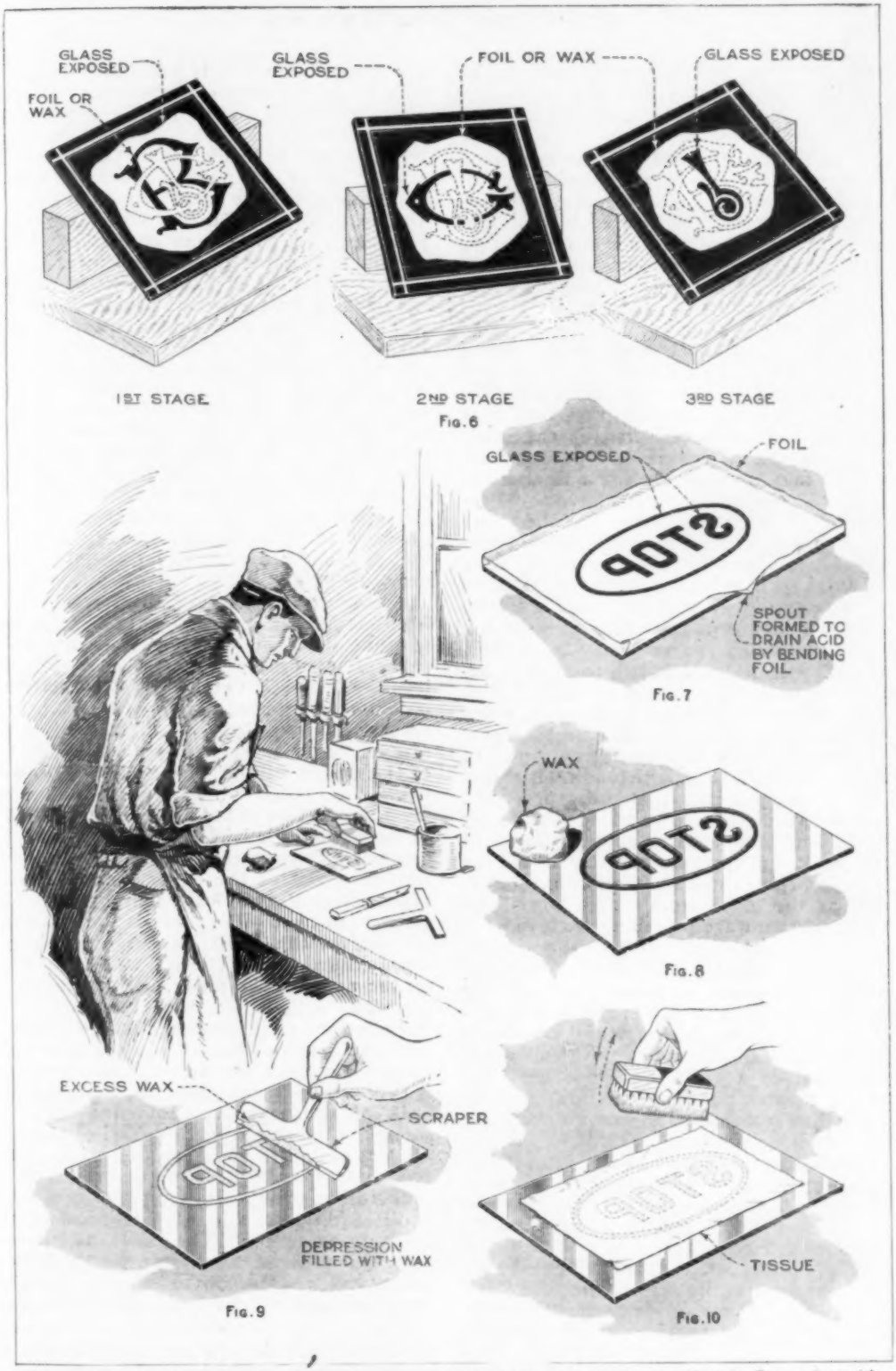


Fig. 5



Various Steps in the Production of Monograms and Master Plates: the Latter Are Used in Connection with the Sandblast Process for Quantity Work

signs of vines, leaves, and the like, can be produced in this way, but this, of course, is subject to the artistic ability and patience of the worker.

The etching process may be combined with sandblasting in the production of quantity work such as is necessary when making, say, the glasses used for automobile stop signals, where it would be almost impossible to make an individual stencil for each one of an order of several thousand pieces. First, a master plate is made by etching on glass. This plate is used only for transferring the design to the work that is to be sandblasted. The glass is covered with lead foil and the stencil is cut in "negative," that is, the parts that are not later to be affected by the sandblast on the work are left unprotected, and so are eaten out by the action of the acid. Also, the design will have to be reversed on the master plate. The best way to go about the preparation of a master plate, if one has occasion to use it, is to cover the whole of one surface of a piece of plate glass with lead foil, turning up the edges in such a manner that they form a tray into which the acid may be poured, and cut the design through the foil as before. The corners should be daubed with wax to prevent leaking. In this way, when etching has been carried far enough, a part of one side of the foil can be bent down to form a lip, as in Fig. 7, through which the acid is run off into a suitably protected vessel. It might here be added that action of the acid is stopped by applying water to the work, and furthermore, that it will eat the enamel off sinks and similar fixtures as well as the glaze from closet bowls and other earthenware plumbing fixtures.

It is not necessary to carry the etching deeply in making a master or printing plate; 1/16 in. will be found sufficient for most cases. The action of the acid is uniform throughout the work and the depth of etching can be found by the "feel" when the point of a knife is slipped over the edge. Master plates of this kind can be made also from metal in exactly the same way, but substituting nitric acid for the hydrofluoric. Needless to say, the surface of the metal should be perfectly smooth. The master plate having been prepared, it will be necessary to prepare a resist, which consists of a composition of resinous and greasy substances, each of which should be proof against the action of acids. One of the oldest recipes gives bitumen, stearin and turpentine; another gives beeswax, Canada balsam and soap, and a third consists of beeswax, turpentine, asphaltum, resin and tallow or lard. No proportions are given because it is practically impossible to do so, since every worker has his own pet formula that he guards religiously, just why no one knows. At any rate, this resist should be made about the consistency of rather stiff putty, and as a starting point one might use equal parts of beeswax and soap, adding Canada balsam or turpentine to get the proper consistency. A thorough mixture of the ingredients with the aid of heat is necessary, but the exact nature and proportion of the ingredients can be varied to a considerable extent. It is evident, however, that too great a portion of the harder substances, such as wax or asphaltum, will make a "short" compound, which will not adhere sufficiently to both glass or paper, while too much soap, stearin, etc., will have the opposite effect. More grease will be required in cold weather and more resin or similar substance in hot. While a variation in the quantity of turpentine or Canada balsam will be found useful, experiment is the only safe guide.

Assuming that a satisfactory resist has been obtained, a scraper having a perfectly straight and rounded edge is another necessity. A portion of the resist is worked into the depression etched into the master plate and the excess removed with the scraper, as in Figs. 8 and 9. If the scraper edge is perfectly true, the cavity of the design will be filled with the resist, while the excess will have been removed from the surface of the plate. Next a sheet of tissue paper is laid over the design and brought into contact with the wax by patting the back of the paper with a small brush, Fig. 10; a cheap nail brush will answer for this. The paper is then pulled off, and if the resist has been properly compounded, the full design will be found on the paper. The paper, with its adhering wax, is then laid, with the wax side down, on the plain glass, and patted lightly with the brush as before. When this has been done until the resist is in contact with the glass throughout the design, the back of the paper is dampened with a sponge; then the paper is peeled off, leaving the design in resist on the glass. Of course, a separate piece of paper is necessary for each operation. The process, while requiring this lengthy description, is really quite simple. The resist, as it has been called throughout, forms a mask or stencil that is acted on but slightly by the sandblast and can be removed afterward.

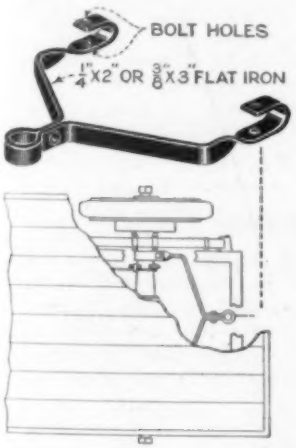
¶A little lead, about 2 per cent, added to molten bronze, will make the casting much easier to cut when machining it.

Centering Work in Lathe

A quick method of centering chucked work, whether it is a rough casting or a machined piece, is as follows: After mounting the work approximately on center, turn the chuck or faceplate by hand and hold a scriber or any convenient tool close enough to the edge to show where the work runs out. In the case of a rough casting, it is often sufficient to put a block of wood or metal on the carriage of the lathe, moving the work until it clears this block about the same distance all the way around. For a machined piece it is best to have a tool with a sharp point to bring it up to the work; a surface gauge resting on the carriage is very convenient and also a scriber held on the toolpost. A strong light on the point is necessary. With this method a careful man can work nearly as accurately as with an indicator.

Convenient Trailer Hitch

Hitching farm machinery or a trailer to the truck, which is frequently done, is an easy matter if a simple hitch of the kind shown in the illustration is attached to the rear axle. It consists of a length of flat-iron stock, 2 or 3 in. wide and ¼ to ⅜ in. thick. The center part is bent to form an eye about 15 in. behind the axle, a rivet being driven through the strap where it is doubled. The ends are twisted and bent around the axle just inside of the spring seats and bolted securely.



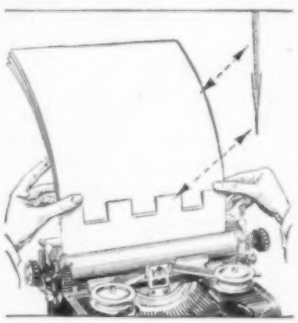
Spectacle Lenses in Camera Hood Aid Photographer

Failing eyesight forces more photographers to retire than old age. This is especially true in case of newspaper photographers and others whose work demands the use of a reflecting camera. Defective eyesight prohibits operating such a camera, and the use of ordinary eyeglasses is impracticable. However, a western newspaper photographer remedied the difficulty by fitting a pair of eyeglasses in the hood of the camera as shown in the drawing. He made a little frame of gold wire obtained at a jeweler's shop to hold the lenses. With this arrangement he can get along without glasses, and is always able to use his camera when going around on his daily assignments.

Eyeglasses Fitted in Hood of Reflecting Camera Aid Photographer Having Poor Eyesight

Crowding the Typewriter

It is usually found difficult to feed any considerable number of sheets and carbons into a typewriter at the same time. This can be done easily, however, by making several cuts in the edge of a sheet of strong paper, and placing the flaps thus formed alternately on either side of the bunch of sheets, then feeding them into the machine as shown in the drawing. In this way the sheets are held tightly and in alinement, and even if it is necessary for any reason to remove them from the machine, and afterward to reinsert them, they can be brought to the same position as before.



Folding Shelf for Ladder

Painters, carpenters and others who use ladders frequently and must have some device for holding tools while working, will find the folding shelf shown in the drawing of considerable assistance. It consists of a 10 by 11-in. board with strips nailed around the sides to prevent tools and articles from rolling off, and two 14-in. lengths of 2 by ⅞-in. wood, which are hinged to the shelf and bear against the underside of the ladder when the shelf is hooked onto a rung. Two iron crosspieces hold the wooden braces securely, and metal braces hinged in the center keep the shelf in a horizontal position when in use and make the device foldable, as shown.

Useful Folding Ladder Shelf for Painters and Carpenters Is Detachable and Portable

The upper end of the lower member of each metal brace is cut and bent over at right angles to catch in a slot cut in the upper member, as indicated in the detail; this prevents the braces from doubling up when weight is placed on the shelf

Frequency of Tillage Operations

The number of times tillage operations are necessary on certain soils depends on the nature of the soil and the kind of weather. Sandy soils must usually be tilled more frequently than clayey soils. Heavy rains pattering down on soils tend to make them more compact, which makes it necessary to loosen them again. During hot weather most soils dry out rapidly and become crusty, which also necessitates tillage operations.

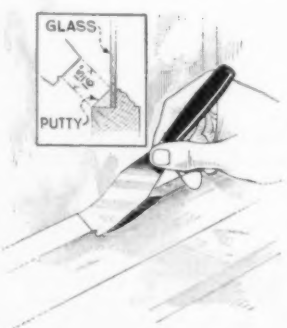
The rapid growth of weeds determines to a great extent how often tillage is necessary. Weeds have been termed "voracious eaters and heavy drinkers," as they rob the crops of considerable food and water. The best remedy is frequent shallow tillage, which should be started before the weeds have made their first appearance, and should be repeated as often as they are about to break ground. By keeping the weeds down in this way it is possible to prevent the loss of a great amount of soil water, which would otherwise be taken up by the weeds.—E. R. Haan, Chicago, Ill.

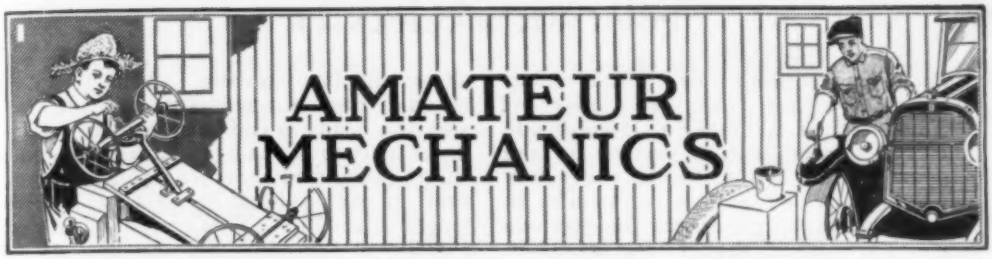
Filing Connecting-Rod Caps

Connecting-rod caps and caps on ball joints can be filed conveniently in the vise when a simple U-shaped holder of the kind shown in the drawing is used. The holder is a length of steel rod of a diameter to correspond to the bolt holes of the cap, and bent to fit in these holes snugly. The handy feature of this holder is that the cap can be removed as often as desired without loosening and tightening the vise.

Laying Putty Evenly

When applying putty to windows on large glazing jobs it is desirable to do the work with speed as well as neatness. It is, however, quite difficult to make the putty lie at the same angle and width all over when running over it fast with a putty knife. To overcome this difficulty it has been found very convenient to cut a notch in the edge of the knife to ride on the edge of the window frame as shown in the illustration. The putty is first pressed on in the usual way and then smoothed off evenly with the knife.





How to Make a Monorail Water Skipper

By L. B. ROBBINS

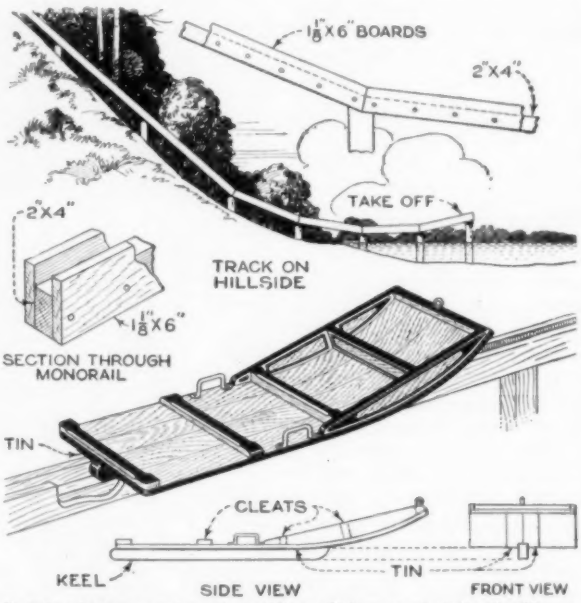
FOR those who love bathing and crave exciting sport with it, a monorail water skipper as described in this article will fill the bill. It can be used wherever there is a steep decline into a sheet of smooth water and will provide plenty of thrills and safe, healthy fun.

The monorail is the first part to build and must be constructed at an angle sufficiently steep to give the skipper plenty of speed before it takes off onto the water. The core of the monorail consists of lengths of 2 by 4-in. stock, turned on edge. The upper surface should be planed and sandpapered smooth, but the remaining three sides may be left rough. Set the posts down the incline in a perfectly straight line to the water, stretching a line between two stakes to get the proper height for each post. Spike the two-by-fours to the posts, making the ends of the abutting members meet over the centers of the posts. Where the rail approaches the water's edge it must be gradually leveled and end in a slight upward sweep as shown. This can be done by making the sections about 5 ft. long or even less, and changing the level of each as they are extended. In any event, the sweep should be planned ahead so that the curve will not be abrupt at any point, otherwise the skipper will not slide easily on the rail. Any undue friction will reduce the speed and retard the take-off. When the timbers are all arranged in their proper position and spiked to the posts, the sides must be nailed on. These consist of planed boards, 6 in. wide, nailed to the 2 by 4-in. timbers so that 2 in. of the boards

A Simple and Easily Made Amusement Device for the Summer Camp, Which Will Provide Endless Amusement for the Bathers

project up past each side of the timber and parallel with it. Use 1⅛-in. boards if possible, as they will make a stronger side and give greater bearing surface for the skipper. At the bends, the top edges may be slightly curved with a drawknife, to smooth out the angle where the sections meet. The take-off should be at least 1 ft. above the water level. Greater height will add zest to the jump, but the length of the slide must be considerable to insure sufficient speed for the skipper to jump far enough without making too great a splash when it strikes the water.

The skipper is built of thin boards, similar to a toboggan. Cut out two sideboards as shown and nail three cleats between them and following their curve. Thin matched boards are best for the bottom, although plain boards may be used. They should be 5 ft. long and should be strengthened with two more cleats on the flat part, as indicated. Just aft of the ends of the sides fasten a handhold to each side of the skipper for the occupant to grasp. A ring should be provided in the bow cleat to which may be attached a tow rope. Turn the skipper over and bolt a keel, 3 ft. long and 2 in. square, down the center of the bottom in the position shown in the drawing. Bolt it solidly through the bottom boards and countersink the heads in the keel so there will be no obstructions. Last, nail a strip of heavy tin or galvanized sheet iron along the bottom on each side of the keel, the entire length of the hull. This presents a smooth surface to the rail. Set the keel of the skipper in the slot of the monorail to see that it fits loosely. If not, plane off some from the sides, and also from the bottom if it tends to rest too heavily upon the top of the core. Then plaster the groove and top edges of the sides with a good grade of soft soap or even light grease. Old oil and grease taken from an automobile engine will do very well. The groove should be made as slippery as possible. Sit down on the skipper and grasp the handholds. Then push off and sit steadily in the middle. The skipper will gather momentum rapidly and should leave the take-off at high speed. If the run has been made sufficiently steep and long enough, the skipper will jump from the take-off several feet before touching the water and will then skip one or more times before losing headway and going under. Then carry the skipper ashore and up the hill and try it again.



Details of Construction of the Water Skipper and Rail; the Upper View Shows How the Rail Sweeps Upward at the End

Preventing Spotting of Shades

Light-colored window shades are often spoiled by stains caused by flies and bugs being rolled up and crushed when the curtain is raised. This usually occurs on cold mornings when the flies are too sluggish to move quickly. A simple method of preventing this trouble is to tie a length of heavy cord or twine across the window and against the curtain so that when the curtain is raised it will rub against the twine and the flies will be brushed off. The twine can be attached to two screw eyes driven into the sides of the window casing.

Preventing Ropes from Untwisting

Untwisting of ropes is usually prevented by tying a knot at the end but it is often desirable to have a rope free from knots. In such cases the best method of preventing the ends from raveling is to clinch a hog ring around them. Large ropes, one or more inches in diameter, need two or three rings but small ropes only one.

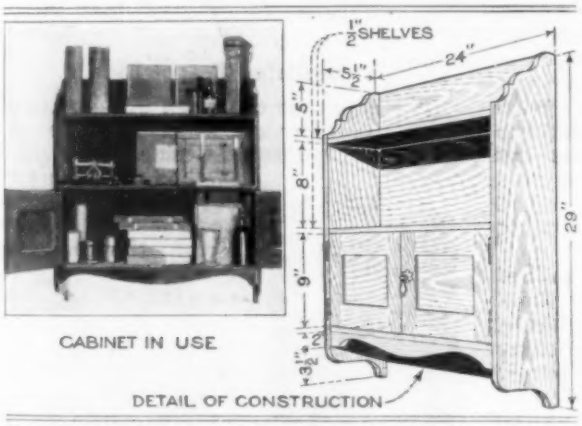
Laying Linoleum

When laying linoleum on floors it is usually quite difficult to keep it flat and tack it down without wrinkling even after it has become warm. To overcome this difficulty first wash the floor under the linoleum with hot water and then lay the linoleum and wash it on its pattern side with hot water also. This will soften it so that it will lie perfectly flat, and it should then be tacked down immediately, before it dries again.—George Glambeck, Milo, Can.

Cabinet for Amateur Photographers

A cabinet of the kind shown in the photo will save the amateur a great deal of time, as it permits an orderly arrangement of various materials and equipment. The width of the cabinet is 2 ft. and three shelves are provided, the bottom compartment being closed by two doors. The dimensions of the closet are given in the detail. The shelves and sides are made of ½-in. wood, while the back is made of lighter material. The door can be fastened by a catch, but if poisonous chemicals are kept in the cabinet, it is safer to provide a lock.

In use, the large tanks, ferrotype plates and storage bottles are best placed on the top shelf; printing paper, frames and scales on the middle shelf, while the lenses, plates or films are safely stored in the lower part. The best method of hanging such a cabinet against the wall at any convenient height is to drill two holes through the back just above the center shelf and then drive two heavy wood screws through these holes into studdings in the wall, which are customarily spaced 16 in. apart.



Neat Wooden Cabinet for Storing Material and Equipment Is Aid to Amateur Photographer

Canvas Sheet for Carrying Brush

Many outdoor workers will appreciate the kink shown in the drawing, which illustrates how a large piece of canvas may be used for carrying piles of brush, twigs, and other rubbish, which is often so bulky and loose that baskets cannot be used conveniently. The canvas is spread out on the ground and the load wrapped or rolled in it; it is then an easy matter to carry it away.—Mrs. A. K. Hinkley, Rowley, Mass.

Simple Method of Carrying Twigs and Rubbish in Large Canvas Sheet

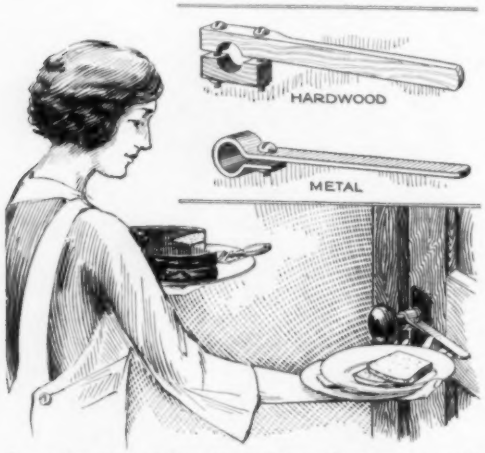
Mending Auto Curtains

When the celluloid curtains of a car are cracked or broken, most owners repair them with adhesive tape or friction tape. A much neater job may be done, however, with the use of motion-picture film. The length of the film to be used is moistened on the emulsion side and the picture rubbed off with a wet cloth so that the film will be transparent. A good cement is then made by mixing celluloid shavings in acetone, adding a little ether to make it quick-drying. The film is given an application of this cement, and is pasted down over the crack or tear. Motion-picture film is better for this purpose than ordinary sheet celluloid because it is tougher and thinner.

¶A piece of adhesive tape pasted to the sole of a new shoe prevents slipping.

Opening the Pantry Door

With both hands holding dishes or food it is difficult to turn a doorknob without dropping or spilling something. An easy

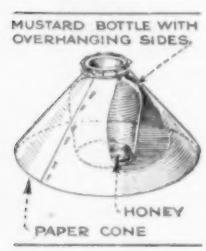


Lever Attached to Kitchen or Pantry Doorknob Permits Door to Be Opened Easily

method of overcoming this difficulty is to attach a short lever to the knob so that it can be turned by simply pushing the lever up. The lever may be made either of a strip of metal or of hardwood and should be about 6 in. long. If of metal, it is bent around the shank of the knob and a short stovebolt used to clamp it tightly, and if wood is preferred, the lever is made in two parts as shown, a small block and two screws serving to clamp it. The lever can be attached to swing horizontally or vertically, as desired. As the ordinary knob has a shank only about ½ in. long, the material used for the lever should not exceed this measurement in width.

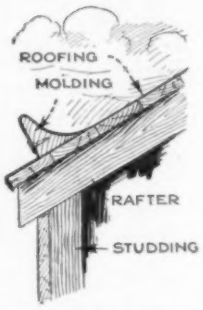
Effective Roach Trap

A simple roach trap, which has proved very effective, can be made from a wide-necked bottle, such as a mustard bottle, and a piece of heavy paper. The paper is cut and formed to a cone, which is fitted over the mouth of the bottle as shown, and allows the roaches to climb to the top, where they fall into the bottle. After they are in the bottle they can crawl up the vertical sides, but as soon as they attempt to make their way horizontally overhead to reach the neck, they fall back to the bottom. A little honey in the bottle serves as bait. In one case, a ½-in. thickness of roaches was found in the trap after it had been set overnight. Ordinary fruit jars are not efficient for this purpose because they do not spread out enough just below the neck and the roaches might fly out because of the large space inside. It is well to wipe the bottle clean each time after it is used; otherwise the sticky surface will permit the roaches to escape.—J. Hobart, Dunedin, Fla.



Gutter for Small Buildings

The drawing shows a simple and inexpensive gutter which has been found practical on small buildings covered with tar-paper roofing. Before the roofing is laid, a strip, about 1 ft. wide, is laid along the lower edge of the roof and a length of heavy molding of the shape shown is nailed along the upper edge of this strip. When the rest of the roofing is laid it is brought down over the molding and nailed to its lower edge, thus forming a waterproof gutter.—Rufus E. Deering, Clements, Kansas.



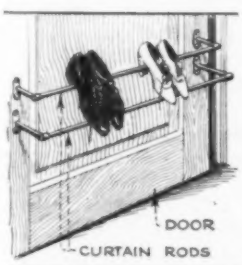
Repairing Teapot Lids

The hinges on enameled teapots are not very easy to repair when they are once loose or broken. Besides, the usual method of hinging the covers is objectionable because dirt will collect in the tiny crevices. A strong and sanitary repair is shown in the drawing. A length of No. 7 hard brass wire is formed into a loop in the middle to fit snugly around the neck of the knob on the cover and the two branches of the wire are brought together and curved to conform to the slope of the lid, with the ends bent outward to hook into the ears on the handle. A hinge of this kind will last as long as the teapot itself and can be removed at any time, to permit thorough cleaning of the pot.—H. E. Gifford, Medford, Mass.

Stopping Leaks in Exhaust Heater

The exhaust heater in my closed car gave considerable trouble by leaking at the joints, which at times allowed a large amount of the exhaust smoke to enter the car, and this was very disagreeable to the occupants especially when the engine was digesting an excessive amount of oil or gasoline. Upon examination of the heater the leaks were found between the flexible tubing that conducts the exhaust into the body of the heater, and the elbows which were solidly attached to the heater. A small roll of asbestos wicking was thoroughly soaked in a cement made by mixing equal parts of litharge and glycerin to the consistency of a thick gravy, and the wicking was then wound tightly around the junction of the flexible tubing and the elbow on the heater. After setting for 24 hours it formed a solid packing around the leaks, stopping them entirely. The heat did not affect the cement. However, in other cases where this method is used, it may be necessary to wrap a piece of light sheet iron around the asbestos wicking to hold it, the sleeve being kept in position by means of a hose clamp at each end. Gasoline-exhaust leaks of this kind are very dangerous, especially in a closed car, and should never under any circumstances be allowed to continue for any length of time.—Carleton F. Worfolk, Royal Oak, Mich.

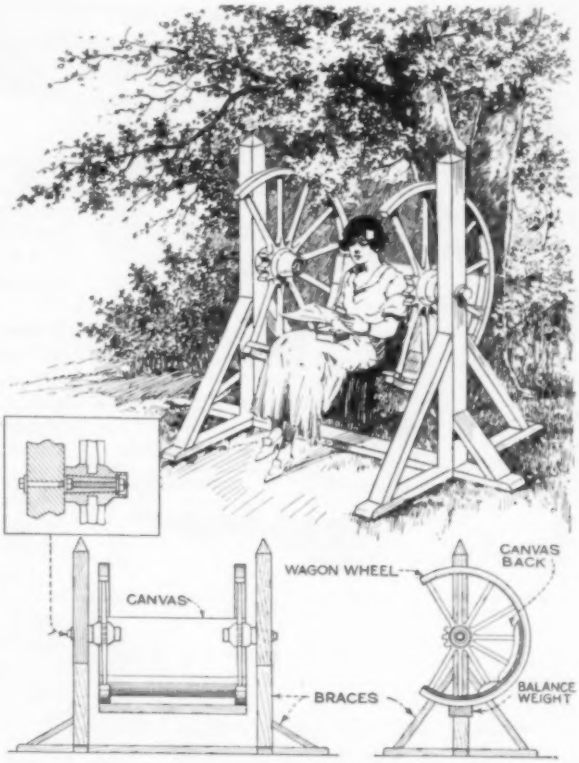
Shoe Rack for Closet Door



A simple and neat-appearing shoe rack can be made from two curtain rods, arranged on the inside of the closet door as shown in the illustration. The lower one should extend about 2 in. beyond the upper one, and they should be 3 to 4 in. apart. The shoes are hung on the upper rack by the heel. This arrangement is especially advantageous in small city apartments, where, in many cases, every inch of space must be utilized.

Wagon Wheels Make Swing Seat

Two old wagon wheels are the essential parts of the novel lawn or porch swing shown in the drawing. A section of the rim, including two or three spokes, is sawed out and removed. The support for the swing consists of two 4 by 4-in. posts, about 6 ft. high and spaced about 4 ft. apart. They are securely braced by means of 2 by 4-in. pieces in the manner indicated. The wheels are mounted on the posts so that the rims are about 18 in. above the ground. The bolts are drawn up tightly enough to prevent play, yet not so tight as to hinder free revolution. Stout slats are nailed across the wheels on the inside of the rims for a distance of about 2 ft., forming a seat which may be cushioned to add comfort. A balance weight is attached under the seat at the point indicated in the lower right-hand detail. A coat or two of white paint adds to the attractiveness of the swing.

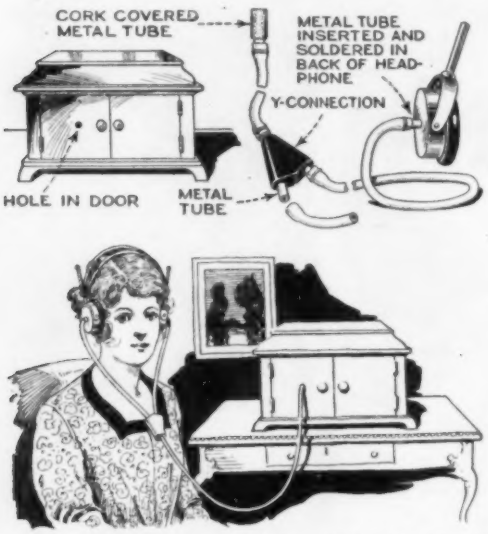


Attractive Lawn or Porch Swing Made from Two Old Wagon Wheels and Ordinary Lumber

¶ Varnished and stained woodwork can be cleaned with ordinary tea water.

Listening Alone to Phonograph

Students and lovers of music can enjoy the phonograph without disturbing others by using the attachment shown in the drawing. It consists of a discarded radio



Attachment on Phonograph Enables One to Hear Music without Disturbing Others

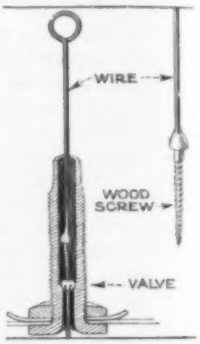
headset and some rubber tubing which connects the phones to the door of the sound chamber. The magnets in the phones are removed, a 3/8-in. hole is drilled in the center of the back of each phone and a short metal nipple is soldered in each hole. Two lengths of tubing attached to the nipples are connected to a single tube by means of a Y of hardwood, hard rubber or metal, which is also provided with nipples. The single tube leads to a hole in the sound-chamber door in which it is held by a cork-covered nipple to make the connection as nearly soundproof as possible. The door is, of course, closed when the phonograph is set in motion.

Protecting Gun from Rust

Every sportsman knows how ruinous water is to firearms. No matter how well oiled they may be kept, rain, fog and especially salt water will do much damage by forming rust. The writer does considerable hunting in salt-water marshes and found his guns rapidly going to ruin from this cause. After several schemes to protect the guns had been found only partly successful, the following method was tried and found satisfactory: An old 5-in. inner tube of heavy red rubber was obtained at a tire-service station. It was cut in two and one end was vulcanized shut, forming a neat waterproof bag into which the gun could be slipped whenever there was any danger of getting it wet. The open end was long enough to fold over the stock, where it was held by a rubber band.—J. E. Hoag, Los Angeles, California.

Removing Valve "Rosettes"

At the bottom of an automobile tire valve stem there is a metal "rosette" which centers and holds the spring in position. Sometimes when changing the inner tube this rosette breaks away from the spring and stem and drops to the bottom of the valve, where it is almost impossible to catch and remove it.



A handy tool for this purpose can be made from a slender wood screw soldered to a 6-in. length of stiff wire, as shown in the detail at the right. The screw must fit loosely inside the valve so that it can be pushed down and threaded into the rosette to hold it securely. The rosette can then be lifted out without the slightest difficulty.

Shoe Protector for the Youngsters

It is a common experience that boys constantly using their coaster wagons wear out the sole of one shoe much faster than the other one, owing to the manner in which the wagon is propelled and braked. Three pairs of shoes and sometimes more are often worn out in this way in one season. A good method of preventing the shoe from such quick wear is to protect it by means of an extra sole, made of thick leather and strapped on as shown, the straps being riveted to the extra sole. Two straps are most convenient to use for this purpose, one for the heel and the other for the toe.

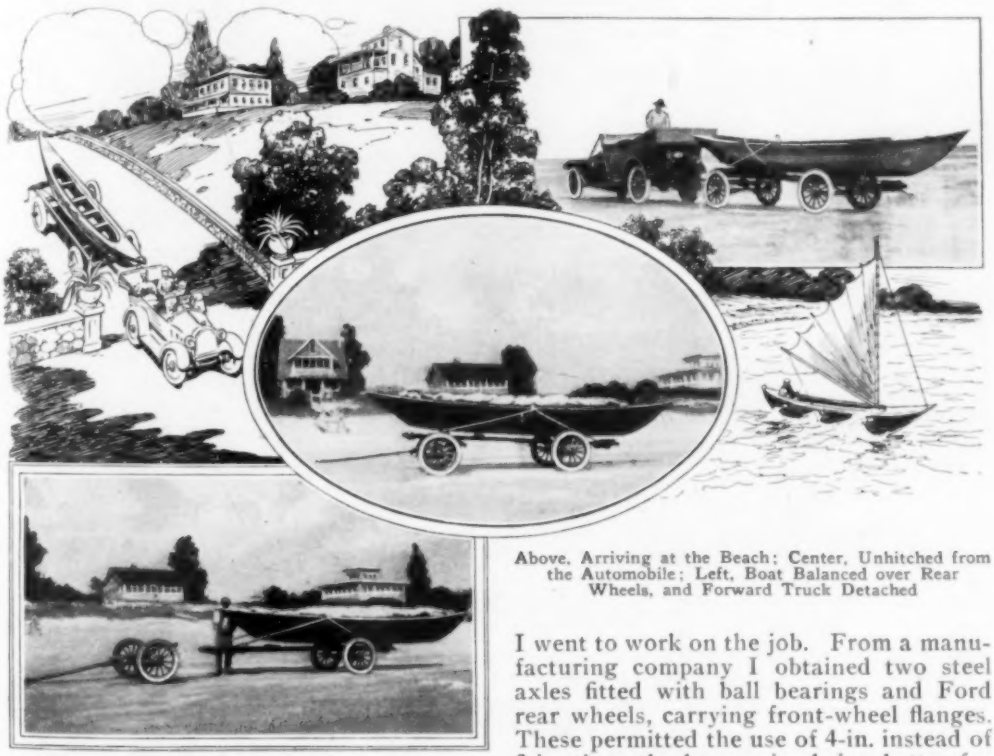
BUILDING A BOAT TRAILER

By W. E. Blodgett

WHEN we moved into our cottage on the beach at Daytona, Fla., and saw the "Atlantic swells" actually promenading in our front yard, I at once was determined to get hold of some kind of a boat that could be launched through the breakers, and sailed in the open sea. There is no inlet here at Daytona, and it was necessary to have some kind of outfit that could be brought down onto the beach, and, after using it, loaded up and hauled away again, as the boat could not be left on the beach. It also was necessary to make it so that one man, or at most two, could handle it.

After some thought, and consultation with an experienced boatbuilder, I decided on a 21 by 5-ft. dory, well decked over at both ends, and with a coaming running around the entire cockpit—what is known as a racing dory. So much for the boat; that was easy, but it was now up to me to devise some kind of trailer to haul it to and from the beach.

As I expected to use it for hauling my fishing boat also to and from the surrounding lakes and streams, I decided that it must have four wheels, and be equipped with some kind of rollers to facilitate loading and unloading, a windlass to enable one man to load the boats if necessary, a universal joint, readily detachable, for disconnecting the forward truck, a quick hitch for attaching it to my automobile and some arrangement for holding the boat securely in position when loaded. With these ideas pretty well established,



Above, Arriving at the Beach; Center, Unhitched from the Automobile; Left, Boat Balanced over Rear Wheels, and Forward Truck Detached

I went to work on the job. From a manufacturing company I obtained two steel axles fitted with ball bearings and Ford rear wheels, carrying front-wheel flanges. These permitted the use of 4-in. instead of 3-in. tires, the larger size being better for use in the sand. From the same source I obtained four automobile springs, and a

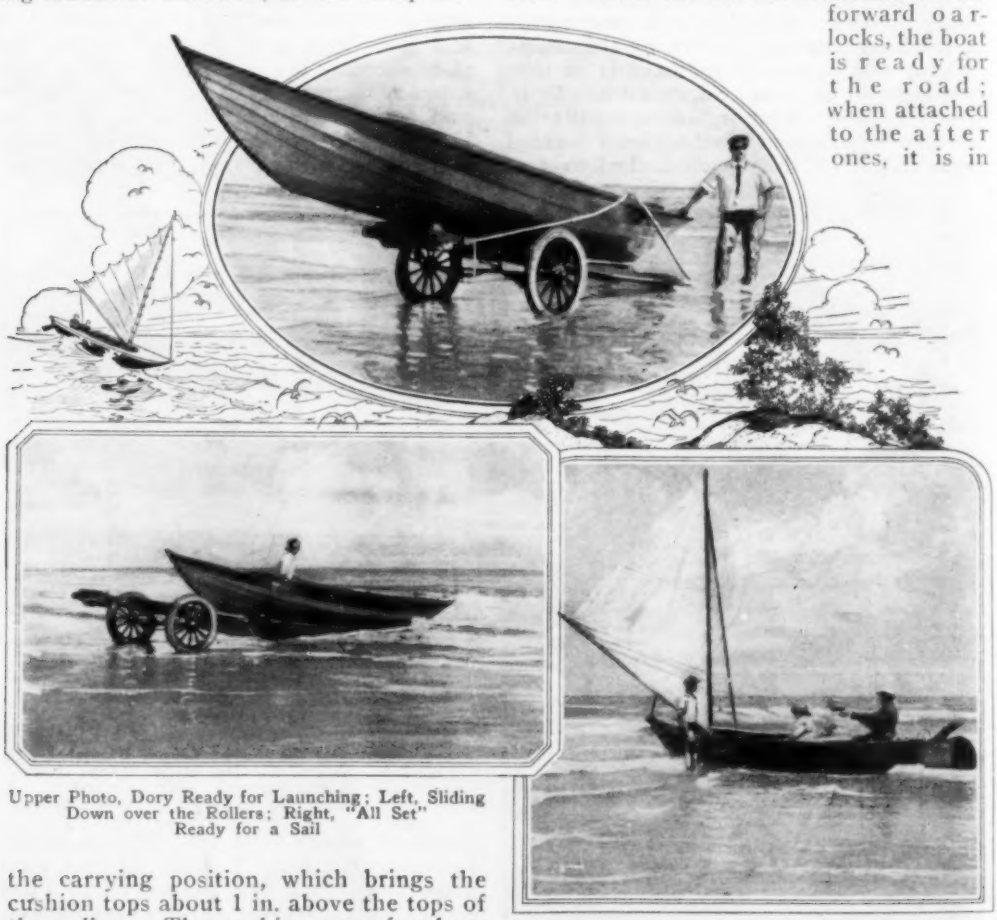
quick hitch that was exactly what I wanted to attach the trailer to my car.

For the side rails, I secured two pieces of clear white-oak wagon stock, 1¾ by 3⅛ in., 14 ft. long. These were fastened together by four ⅝-in. steel rods, threaded at both ends, and with nuts and washers on both sides of the rails. The outside width of the frame was 30 in. Four 3-in. hardwood rollers, with bronze caps on each end, were then fitted in place, the ¾-in. pins running in bronze bearings bolted to the side rails, as shown in the detail.

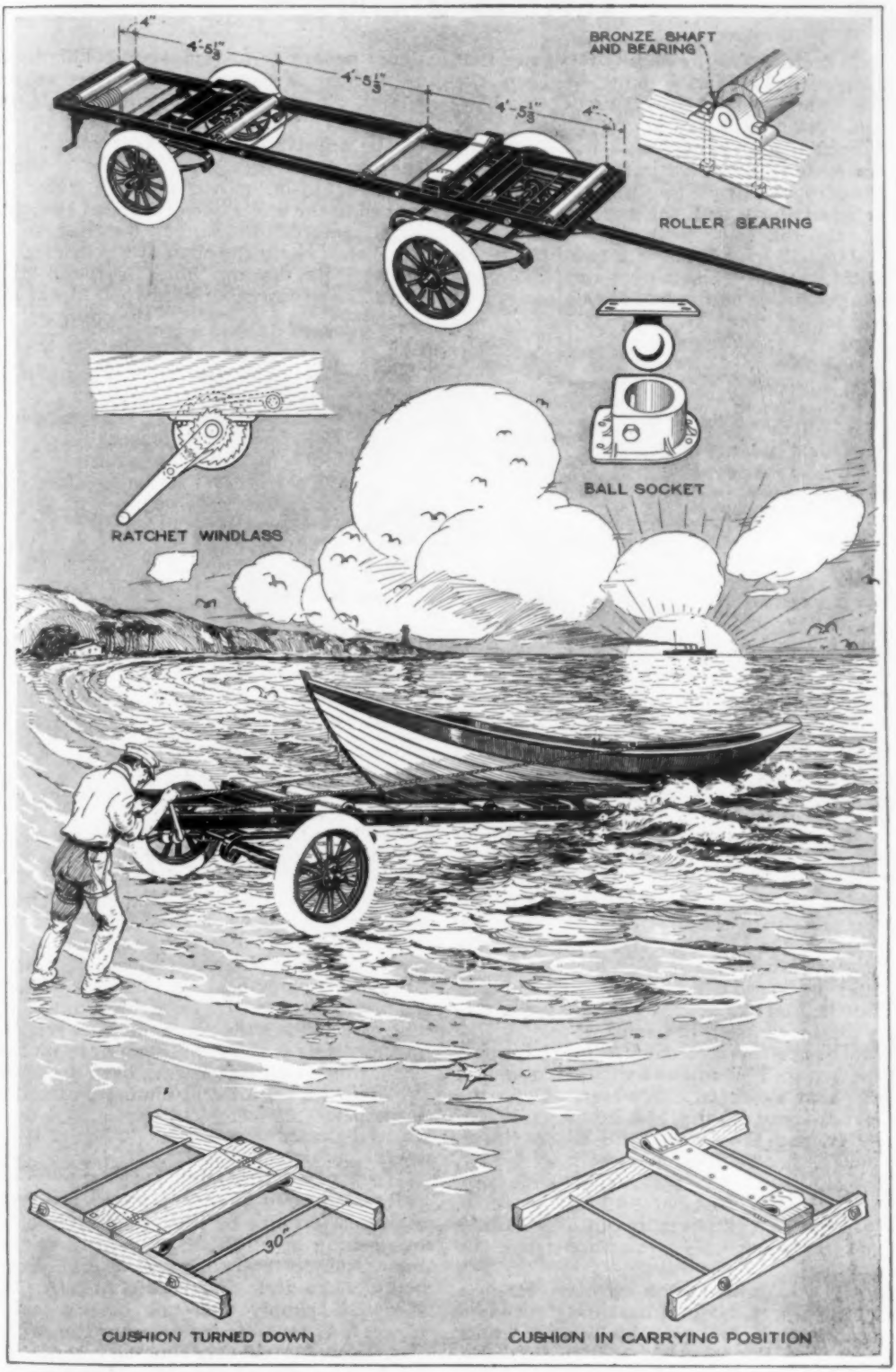
Two carrying cushions, shown in the detail, were made of two pieces of oak, 1⅛ by 4½ in., 30 in. long. The lower piece is bolted to the upper side of the rails at each end, and the upper hinged to the lower so that it can instantly be turned down out of the way when the boat is being loaded or unloaded, or turned up into the carrying position, which brings the cushion tops about 1 in. above the tops of the rollers. The cushions are faced on their upper sides with two thicknesses of cotton fire hose, with the ends rolled over, and screwed in place. When the cushions are turned down, the hose fits between the rails, out of the way.

The windlass is attached to the underside of the rails, at the rear end. It is provided with a ratchet dog, bearing on a ratchet wheel on the windlass shaft, to hold the boat in any position, and also with a ratchet crank handle, so that if the boat is slid back into the balanced position where it is impossible to turn the handle completely around, the ropes can be tightened by pumping the handle up and down.

The two side lines, after being wound around the windlass roller, are run through cheek halyard blocks attached to the forward ends of the rails on the inside, then carried back and made fast to the after ends of the rails. Each line has a loop about amidships that can be slipped over the oarlocks for holding the boat in position. When the lines are attached to the forward oarlocks, the boat is ready for the road; when attached to the after ones, it is in the balanced position ready for launching; in either case the lines are tightened by one or two turns on the ratchet handle, and



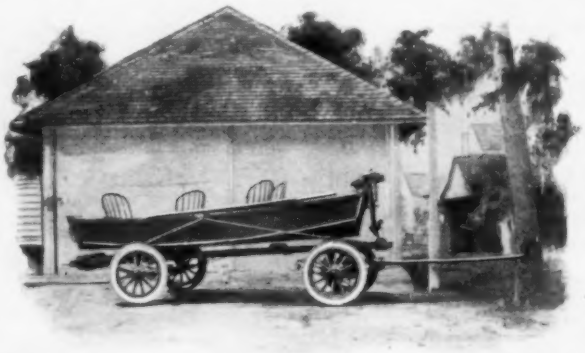
Upper Photo, Dory Ready for Launching; Left, Sliding Down over the Rollers; Right, "All Set" Ready for a Sail



Details of Parts of the Trailer, Showing the Construction of the Folding Cushions, Ball-and-Socket Joint, and Ratchet Handle for the Windlass; Also Method of Drawing the Boat from the Water

held securely by the dog. The device that forms the universal joint between the trailer bed and the forward truck is a ball-and-socket joint, and not finding just what I wanted on the market, I made patterns for it, and had it cast in brass at the local foundry, afterward finishing the parts myself; similarly with the caps and bearings for the rollers.

The ball joint is made in two parts, each with a flange for bolting it on. The cup-shaped lower half is bolted to a crosspiece on top of the forward truck, and receives the ball-shaped upper half, which is attached to a crosspiece bolted to the underside of the trailer bed at the forward end. A ½-in. bronze bolt, passed through the lower half, holds the ball securely in place, the bolt itself being secured by a spring collar fitting into a groove near one end. This joint is instantly separable by withdrawing the bolt, is very strong and has never given a moment's trouble.



Fishing Boat with Swivel Chairs Mounted on the Trailer Ready to Start for a Day's Sport

Now suppose we have reached the beach for a sail: First loosen the side lines by releasing the ratchet dog, hoist up the stern of the boat and drop the cushion, then do the same with the bow cushion. Slip the loops off the forward oarlocks and roll the boat back until the loops will slip over the after ones, take a turn on the windlass handle, and the boat is held almost exactly balanced over the rear wheels. Now detach the forward truck by withdrawing the bronze bolt in the ball joint, and lead the boat down to the water. Drop the forward end of the bed in six inches of water, slip the loops from the oarlocks, and the boat will launch itself, stern first, which is the better way, as the wider end picks up and floats better than the bow.

In drawing the boat up out of the water and reloading this procedure is simply reversed.

My fishing boat is an ordinary flat-bottomed cypress boat with a tilting outboard motor attached; we handle it on the trailer in exactly the same manner as the dory, and because of the tilting device on the motor it is bolted to the boat, as it is never necessary to remove it. This little 14-ft. boat is equipped with four swivel chairs, which make it very comfortable for an all day's fishing trip. These chairs are of the regular hardwood kitchen variety, each with its legs sawn off and a short piece of ¾-in. galvanized-iron pipe attached to the underside of the seat through a galvanized-iron flange, fastened to a bevel cleat to tilt the chair at a comfortable angle. By boring holes through the thwarts and fastening hardwood blocks on the bottom of the boat to receive the lower ends of the pipes, we have comfortable swivel chairs which can be placed so as to balance the boat properly, and each one of which can be swung through a complete circle. Anyone who has been out on an all-day fishing trip, sitting on the ordinary flat-board boat thwart seat, and with no "lean back" whatever, will appreciate this device, which is very simple and can be arranged in any fishing boat.

We have been using this trailer for eight years now, and it has proved satisfactory in every way. On our fishing excursions we sometimes have to launch our boat down a steep bank, and we always carry a long line for this purpose, easing the boat down into the water by taking a turn around a tree or post, and hauling it back up the bank again by fastening the line to our car, but whether launching or reloading, or going at thirty miles an hour on the road, this trailer has always been a stanch and faithful friend and almost automatic in its performance.

Reducing Pressure in Water Piping

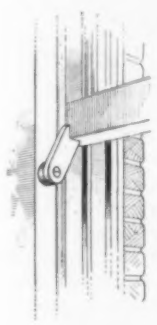
Remembering that the water pressure at any faucet may be reduced considerably by opening up all the other faucets in the house, may often prove very useful, especially when it is impossible to turn off the main supply. In one case a leaky faucet was repaired by opening the other faucets, and at another time an emergency patch was held in place on a burst water pipe by reducing the pressure in this way.

Improvised Roofing Paint

While laying a new paper roof we found that the tin roof of the bay window was badly rusted and full of pinholes. The necessity of replacing it was evident, but we had neither the material on hand nor the time to obtain more, as it was late in the season. A small amount of roofing cement had been left in each can, and this was all collected together, gasoline being used to remove every trace that had stuck to the sides and bottoms of the various cans. The cement was allowed to stand in the wind and sunlight until most of the gasoline had evaporated, leaving the liquid about the consistency of thick cream; this was then painted on the leaky roof. No attempt was made to remove the rust, as the rust held the paint better than the bright tin would have done. The first coat was rubbed in well and allowed to dry thoroughly. The effect was jet black, which contrasted too strongly with the slate-gray color of the main roof and therefore we decided to make it match. This was done by adding a little whiting mixed in gasoline to the black liquid until the correct shade of gray was obtained, and then applying it over the black. The second coat flowed like varnish, gave the desired shade, and, together with the first coat, it covered the roof so well that not a leak has been found since.—Xeno W. Putman, Harmonsburg, Pa.

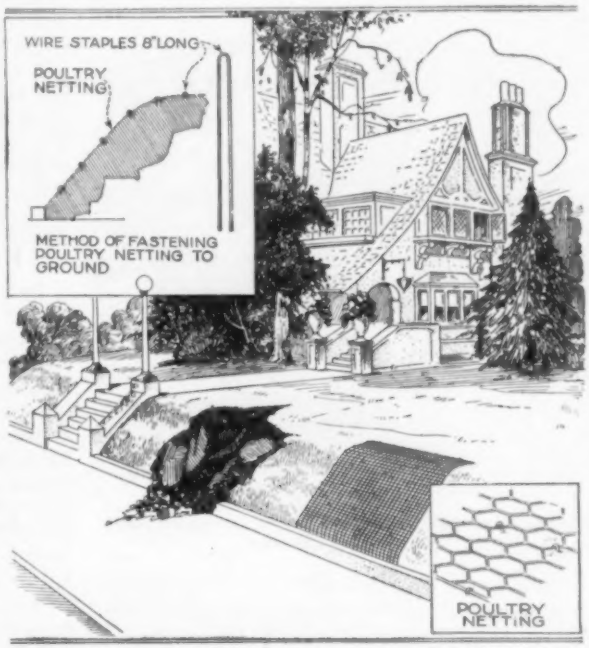
A Neat Window Prop

Windows in old houses sometimes are not equipped with counterweights to balance the sashes, which makes it necessary to use a prop to hold them up. If these props are not at hand when needed, which often happens, a substitute must be looked for. A handy prop that can not be lost is shown in the drawing. It consists of a short piece of wood, with a notch cut in one end to receive the lower edge of the sash. The other end pivots on a screw driven into the casing, so that the prop instantly can be swung into place.



Resodding Washouts

On terraces and sloping lawns where frequent washouts occur and the watercourse cannot be changed, the method of repair shown in the illustration has been found entirely effective. The damaged portion of the bank is filled, regraded and resodded, and the sod covered with lightweight poultry netting. This is held in place by means of 8-in. staples made of medium weight galvanized-iron wire. This will retain the new sod and prevent the loose earth from being washed away easily. The netting is, of course, removed after the sod has taken firm root. If seed is sown on the bare bank, the same method serves as well.



Poultry Netting Laid Down and Stapled over New-Sodded Bank Holds Sod until It Takes Root

Silencing Brake-Rod Rattles

Rattling caused by brake-rod connections can be greatly decreased by squeezing the yoke of the clevises together with a pair of ordinary slip-joint pliers so that the eye ends of the rods will fit snugly. After oiling thoroughly the pin is replaced and the connection will be found to be free from rattles, and less apt to wear quickly.

Combined Safety Vault and Bathtub for the Summer Cottage

Space is usually at a premium in a summer cottage, and many pieces of furniture must serve a double purpose. In cases

Combination Bathtub and Safety Vault Arranged under Floor in Small Cottage

where no space is available for a bathtub, a novel arrangement of the tub under the floor, as shown in the drawing, will be found very convenient, and the tub will also serve as a vault when the cottage is unoccupied, as it is located under the surface of the floor and the cuts in the latter may be completely hidden by a rug.

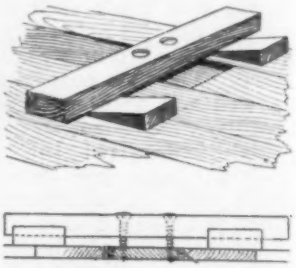
A section of the floor is cut out and the tub then fastened securely under it. This can be done by means of heavy wooden cleats fastened to the joists so that they project under the tub flange, or by blocking up the tub from beneath. The drain should be connected to a shallow sink hole filled with small stones.

A Natural Fly Poison

There are many kinds of fly poison on the market but for the last 50 years Mrs. J. T. Davidson, of Shepherd, Tenn., has been growing her own fly poison, which she regards as one of the most dependable exterminators available, and she is never without it but grows it in her garden every summer. The plant from which this fly poison is made is the apple of Peru, which grows wild almost all over the United States. It grows to a height of from 3 to 9 ft. and has a strong rigid stem, which often becomes as large as a human wrist. The flowers are light blue, about an inch long and as wide. To prepare the poison, the leaves and stems are crushed to a juicy mass, to which some sweet milk or cream is added. When first crushed the product gives off an offensive odor but the addition of sweet milk makes it very attractive to the flies so that they will not leave it alone. After feeding on it they soon drop dead; its action is certain. On the other hand, it is not poisonous to barnyard fowls such as chickens, which have often been seen eating it without evil consequences ever being noticed.—Robert S. Walker, Chattanooga, Tenn.

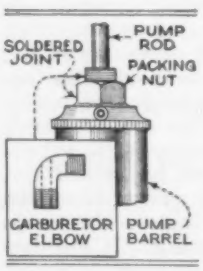
Drawing Up Sunken Floorboard

In cases where old floorboards must be raised and toenailed in place by one man, the simple device shown in the illustration will be found useful. It consists of a short length of 1-in. wood which is screwed to the floorboard to be raised and two wooden wedges to be driven under the ends of this piece. After forcing the wedges in far enough to pull up the floorboard so that it is level with the rest of the floor, it is toenailed in place securely. —G. A. Luers, Washington, D. C.



Repairing Hand Tire Pumps

Sometimes the stuffing box at the top of the small cylinder of two-barrel hand pumps breaks or wears out while the remainder of the pump is still good. In many cases the pump can be repaired by the use of a Ford gasoline-pipe pack nut and elbow. After removing the old stuffing box, the pack nut is soldered, with the large opening up, to the top of the pump. The carburetor elbow can either be cut off just below the bend and reamed to fit the pump rod, or the hole simply drilled through and reamed. The whole elbow is used in the latter case for ease in tightening.—E. T. Gunderson, Humboldt, Iowa.

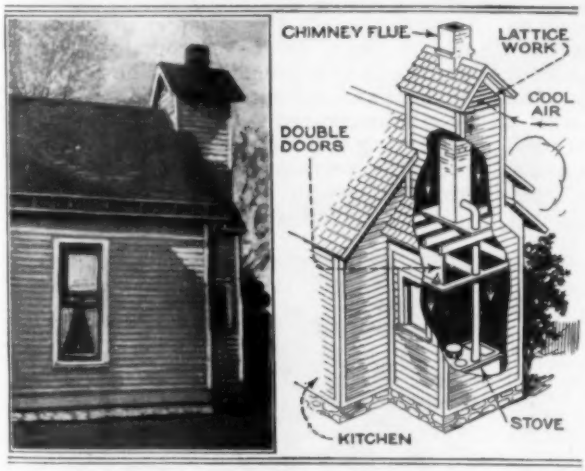


Popping Corn in Kettle

A common kettle makes as good a corn popper as can be purchased. It is best to use an aluminum kettle with a tight-fitting cover. The corn is put in the kettle and the smallest burner of the gas or oil stove is turned about half open. It is, of course, necessary to keep the kernels in constant motion by shaking the kettle back and forth. The advantage of this method of popping corn is that nearly every kernel will pop, as the kettle retains all the heat. Furthermore, no dirt can fall into the burner of the stove, as is always the case with corn poppers made of wire mesh.

Cooking Room for the Stove

During the summer months the average farm kitchen is a very hot place to work in, especially if a range is used for cooking. Much of the discomfort can be eliminated by providing a small cooking room adjoining the kitchen but closed off by a door. This room should be just a little larger than the space occupied by the range and a small table and should be well ventilated. This can be done best by means of a cupola which has lattice-work gables and a brick chimney in the center, as shown in the drawing. The chimney rests on joists level with the kitchen ceiling, as shown, and a pipe connects the stove with it. About 8 ft. from the floor, a ceiling consisting of close-fitting double doors is put in. In summer these doors are kept open. This arrangement permits a constant circulation of air, which carries off the excess heat.—Mrs. S. G. Stice, Cerulean, Ky.



Small Cooking Room Makes House More Comfortable during Hot Summer Months

Towing Small Boats

When the stream is flowing so fast or the wind blowing so hard that it is difficult to make headway by rowing, the simple stunt shown in the drawing offers an easy way of towing the boat along the bank or shore. Tie the boat line to both bow and stern, as shown. By paying out on the bow part of the line and holding in the stern line, the boat can be kept nearly parallel with the bank, while if only a bow line is used the current or wind will cause the bow to dig into the bank, making towing difficult. If a narrow creek is encountered, its mouth can be crossed in the boat as follows: Let out the bow and haul in the stern; this will cause the boat to lie close against the mouth. Fasten the towline to an oar pushed slantingly (toward the water) into the bank. After walking across the creek in the boat, the oar is pulled out, which can readily be done on account of the slant at which it is placed.

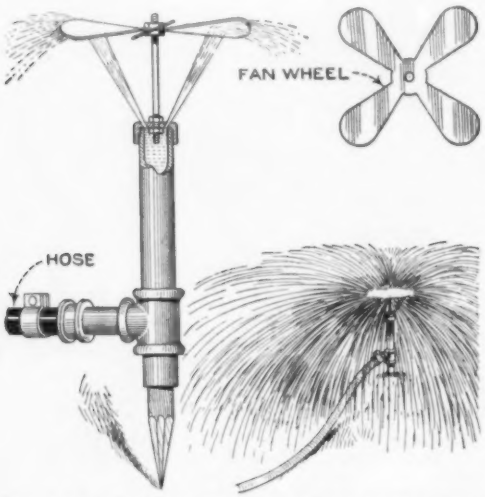
Method of Towing Rowboats and Small Sailboats Upstream against a Swift Current or Hard Wind

Mending Radiator Leaks

It occasionally happens that a leak is discovered in the radiator when traveling in the country many miles from a garage, and it is, of course, advisable to make a temporary repair. A piece of chewing gum forced into the opening will harden quickly due to the heat, and will stop the leak effectively. Gum is much better for this purpose than a sharpened match or toothpick, as it holds better.

Novel Homemade Lawn Sprinkler

A homemade lawn sprinkler of novel construction, which will distribute the water in a fine spray over a large area, is shown in the illustration. It is made of short



Novel Lawn Sprinkler Distributes Water in Fine Spray by Means of Small Fan

lengths of gaspipe and fittings, assembled as shown, a pointed wooden plug being driven into one end of the vertical piece to serve the double purpose of a support for the sprinkler and of a plug to prevent water from leaking at the bottom. The upper end of the pipe is provided with a cap having four small holes drilled through it at an angle to the center of the pipe. The cap also supports a rod, 6 in. long, upon the end of which a four-bladed sheet-metal fan is fitted to revolve freely.

The hose is attached to the sprinkler as indicated, the wooden plug pushed into the ground and the water turned on. The four tiny streams of water shooting out of the top strike the blades of the fan, and the spinning of the latter will then scatter the water around in a fine spray. The holes in the cap should be drilled at such an angle that they will strike the center of the blades, and the fan diameter should not be too large, else it will revolve too slowly.—G. E. Hendrickson, Argyle, Wis.

¶Large numerals cut from calendars make excellent labels on closed boxes containing screws and nails, to indicate different sizes, and numerals of different colors can be used to indicate different kinds of nails, as, for instance, common nails and finishing nails.

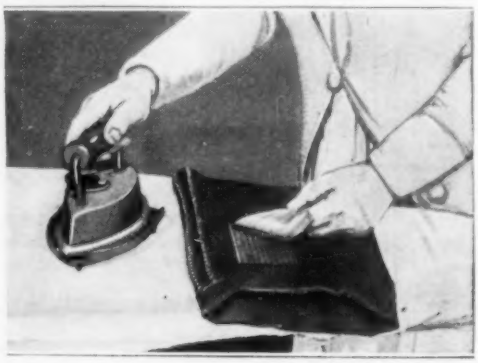
Closet-Tank Repairs

A worn-out washer on the discharge valve of a water closet allows the water to run out of the tank into the bowl continually. This trouble can be remedied by bending the rod to which the float is attached so as to force the float downward, which will exert greater pressure on the washer, causing the valve to close tightly.

When the flush ball refuses to seat properly and the ball is not pressed out of shape, a repair can be made by loosening the guides through which the wire on the ball runs, centering it perfectly and then retightening the guides. If a new ball must be installed, the correct size should be obtained. Examine the original ball and get the number, or if it has no number, see that the new ball fits with the ridge about ¼ in. from the seat.—Chas. Hubertz, Corry, Pa.

Patching Clothes with Rubber Tissue

When patches are cemented on garments by means of rubber tissue, which can usually be obtained at a tailor shop, the patched area will be somewhat stiffer than the surrounding cloth. For this reason this method of patching has not met with much favor. However, by perforating the tissue with a number of holes and then using it in the customary way, the patch will be more pliable. The area to be mended and the surface of the patch itself should be cleaned with gasoline before the cementing is done. The tissue is cut to fit the patch, perforated, and the patch is then pressed down on it by means of a flatiron just hot enough to sizzle; if this does not



Using Rubber Tissue, Perforated to Make It Flexible, to Cement Patches on Clothes

melt the rubber so that the patch sticks, heat the iron a little more.—E. W. Cornell, Adrian, Mich.

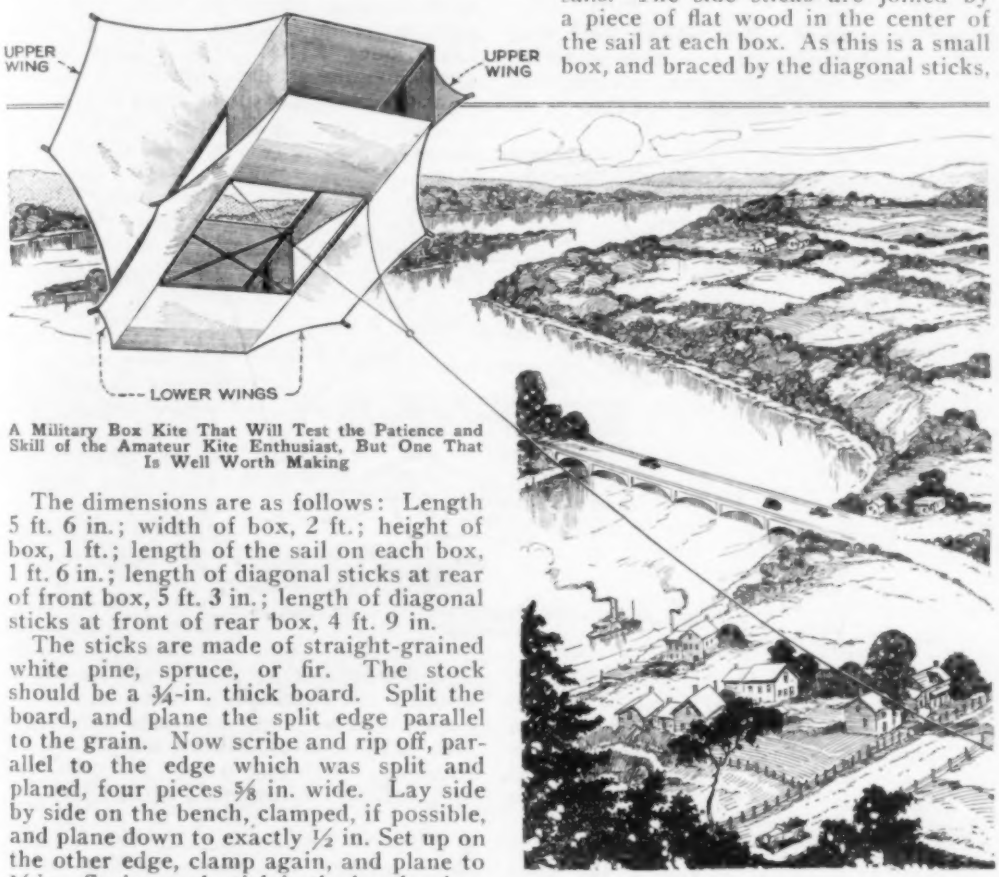
Making a Military Box Kite

By H. S. RINKER

THE kite described in this article requires both skill and patience to make successfully. For the dyed-in-the-wool kite "bug" this will be an added attraction rather than a drawback, because this particular fan has as much fun making kites as flying them.

This kite is a modified form of the very elaborate kites used in military service for photographing, signaling, and even for sending aloft an observer, if made of appropriate size and strength.

The main frame is an ordinary Blue Hill box. Added to this are four wings which greatly increase the sail area, while adding very slightly to the weight of the framework. The appearance of this military kite in the air is very striking and unusual.



A Military Box Kite That Will Test the Patience and Skill of the Amateur Kite Enthusiast, But One That Is Well Worth Making

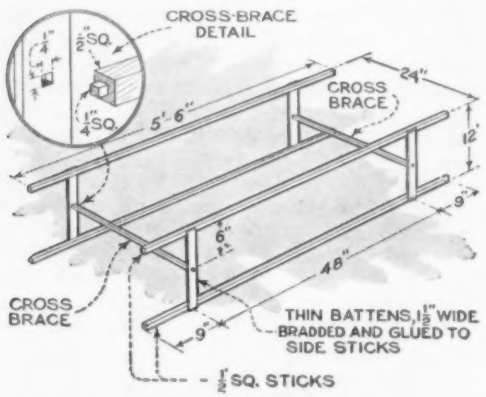
The dimensions are as follows: Length 5 ft. 6 in.; width of box, 2 ft.; height of box, 1 ft.; length of the sail on each box, 1 ft. 6 in.; length of diagonal sticks at rear of front box, 5 ft. 3 in.; length of diagonal sticks at front of rear box, 4 ft. 9 in.

The sticks are made of straight-grained white pine, spruce, or fir. The stock should be a ¾-in. thick board. Split the board, and plane the split edge parallel to the grain. Now scribe and rip off, parallel to the edge which was split and planed, four pieces ⅝ in. wide. Lay side by side on the bench, clamped, if possible, and plane down to exactly ½ in. Set up on the other edge, clamp again, and plane to ½ in. Spring each stick in the hands when finished, to ascertain that it bends evenly and has no weak spots. The four diagonals are also ½ in. square, but of different length. All kite sticks must be made as described above to obtain reliable results in use. The majority of the fibers in each stick must run the full length to assure adequate strength. Failure to observe this precaution may be a cause of failure when the kite is in the air. The sails for the box should be made first.

Two strips of cambric, 19 in. wide, are required. Hem both sides on a sewing machine, making them 18 in. wide when hemmed. Make them 6 ft. 1 in. long, square one end, put together, and sew across with a ½-in. seam. This makes an endless loop, 6 ft. long when finished.

The frame of this kite, as previously mentioned, is an ordinary Blue Hill box. The bracing, however, is different, and somewhat simpler. It is braced inside the sails. The side sticks are joined by a piece of flat wood in the center of the sail at each box. As this is a small box, and braced by the diagonal sticks, a piece of the wood from an egg crate, a peach basket, or any thin veneer will answer. Make each 1 ft. long by 1½ in. wide and tack at ends with three ⅝-in. brads.

No. 17 wire gauge, fastening at the same time with prepared glue. In the center of



DETAIL OF FRAME

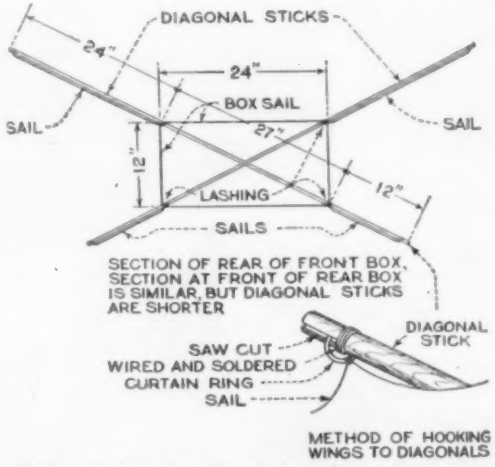
Details of the Box Frame; Note How the Cross Braces Fit into the Battens

these strips make a ¼-in. square hole. Cut two braces of the ½-in. square material. Make them 24½ in. long, and for a length of ¼ in. at each end cut them down to ¼ in. square. Put the two side frames through the sails, and fasten the cross seams to the top stick of one frame by gluing them. Snap the cross braces in place, and the box will stretch into shape. It is wobbly yet, as the single stick does not give any rigidity. But ignoring this fact for the time being, get the sails trued up and glued to the other sticks.

Now take the diagonals. The two front diagonal sticks are ½ in. square and 5 ft. 3 in. long. Mark 2 ft. from one end. Put this point at the top stick on one side. A point 2 ft. 3 in. from this should touch the bottom stick on the other side, while 1 ft. will project beyond it downward. These two sticks are at the rear of the front-box sail.

Two more sticks, 4 ft. 9 in. long, are arranged in a similar manner at the front edge of the rear-box sail. Of these sticks 1 ft. 9 in. should project upward, and 9 in. downward from the box frame. Lash all this in place temporarily with string. You will note that the kite is now braced so it cannot get out of square. Now we have four more sails to make. Two of these are 5 ft. 6 in. long, 2 ft. wide at the front stick, and 1 ft. 9 in. at the rear stick, tapering to a point at the extreme front and rear. The other two are similar but smaller, being 1 ft. wide at front stick, and 9 in. wide at rear stick, tapering as before. Run a ½-in. hem, turned over twice, along the profile edge, and a similar hem, turned only once, on the long straight edge. These sails should be somewhat scant in the transverse dimensions, as they attach to the diagonal sticks with a small wire ring sewed at each angle, and they should stretch in snapping the ring in place so that the sail will be taut. It is well to run a strand of the finest picture wire around the profile edge of these sails, folding it into the double hem, as it is sewed.

The long plain edge of these sails are each fastened to a box stick; the large sails to the upper sticks, the smaller to the lower ones. The kite is bridled in the same manner as the Blue Hill box, that is, at the rear edge of the front sail, on the lower sticks. Use a bridle string about 5 ft. long. The most practical way to fasten the diagonal sticks is by lashing them in place where they cross the box sticks. This lashing can be permanently attached to the diagonal sticks and tied around the box sticks with a bow knot when the kite is set up.



Method of Attaching Diagonals to Box, and Sails to Diagonals

Made as described herein, this kite will knock down flat, like the Blue Hill box. It cannot be rolled. The dimensions given above may be reduced or increased in proportion, and, as a matter of fact, may be varied somewhat. One of these kites will test a No. 22 piano wire in a 10-pound wind. Its total sail area (lifting) is nearly 32 square feet.

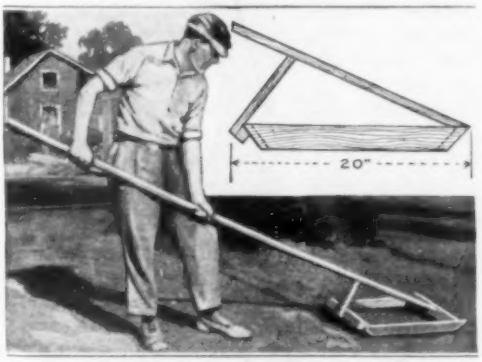
¶When no regular metal polish is available, automobile valve-grinding compound, of various grades to suit the work, will be found an excellent substitute. However, due to the abrasive quality of the compound, it cannot be used for silverware or similar fine surfaces.

Saving Ink in Fountain Pen

When a fountain pen delivers too much ink on first starting to write, it is an indication that the sack is nearly empty and the air contained in the barrel is expanded by the heat of the hand. The surplus ink on the pen is usually shaken off but this is not desirable especially if there is no more ink for refilling at hand. It is much better to hold the pen, point up, and force a bubble of air out with the self-filler, after which the pen will usually work satisfactorily. When the pen is dry and no ink is handy, a few drops of water in the barrel will give good results as it dissolves the little ink that still remains.—Harold E. Benson, Boulder, Colo.

Simple Pulverizer for Seed Beds

Leveling lawns and pulverizing the soil properly when preparing it for seeding cannot be done with a rake but requires a special tool. Such a tool can readily be made in a few moments from scrap pieces of wood around the house. It consists of a frame, about 18 by 20 in. in dimensions, made of 1 by 2-in. wood, a long handle of similar material, attached as shown in the photo, and 1-in. wire mesh stapled to the underside of the frame. The front and rear ends of the frame are set at an angle as shown in the detail, to facilitate pushing it over the ground. By working it



Simple Tool Made of Wood and Wire Mesh Aids in Leveling and Pulverizing Seed Beds

backward and forward, the lumps are soon reduced to small particles and the surface leveled.—E. M. Love, Alhambra, Calif.

If chemicals are used to remove stains on clothing, they should be applied before the clothes are washed, as washing gives the stains a firmer hold.

Easily Constructed Floor Sander

Floors will be much improved by occasional sanding and varnishing, but as sanding is a very tedious task if done by hand

Homemade Floor Sander Consisting of 2-in. Block, a Broom Handle, and a Lead Weight

with the use of a small block, the tool illustrated will be found much more convenient.

It consists of a 2-in. block of wood cut to the size of a standard sheet of sandpaper and with the ends beveled off so that the heads of the thumb or carpet tacks used for holding the sandpaper will not touch the floor. An old broom handle or other suitable length of wood is fastened to the block by means of two pieces of strap iron, screwed tightly to the handle and loosely to the block so that the handle can be moved backward and forward freely. One or more flat pieces of lead or other heavy metal are fastened securely to the block by means of a stout cord or twine, threaded through two screweyes that are driven into the top as shown.—Walter X. Brennan, Mt. Clemens, Mich.

Bending Celluloid Spectacle Frames

Celluloid spectacle frames can easily be bent by first heating the part to be bent just enough to make it pliable. This can be done over an electric toaster or hot plate, or better still, in hot water as there will then be no danger of the celluloid catching fire. The celluloid must be thoroughly warmed before bending, to prevent it from breaking.

Combination Camp Table and Bench

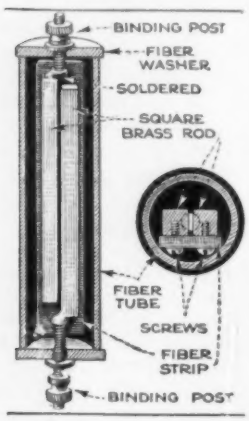
The combination camp table and bench shown in the drawing is easily made and is more useful than the ordinary table, as the

Combination Camp Table and Bench Which Has Been Found Useful

top consists of two boards which can be swung over to form backs for the benches. In their normal position on the table these two boards rest on pins or cleats fastened to the inside of the upper crosspieces; they pivot at both ends on long bolts passing through the brace, crosspiece and into the board. Both sides of the boards should be smooth, as one side is used as a back rest and the other as the table top.

Neat Lightning Arrester

A neat lightning arrester, which is cheap to build and of durable construction, is shown in the illustration. Two straight pieces of ¼-in. square brass rod, 4 in. long, are drilled and tapped at the ends for short 6-32 screws, and a strip of 3/16-in. fiber, about 5 in. long and ⅝-in. wide, is drilled so that the rods can be attached to it as shown in the detail. To one end of each rod a ¼-in. machine screw is soldered, half of the head being cut away to fit over the rods, as shown. The rods are first mounted on the strip loosely, two thicknesses of newspaper being inserted between them, and are held together with the fingers while tightening the screws, after which the paper is pulled out. A 5¼-in length of ¾-in. fiber tubing is cut and slipped over the assembly, and a large fiber washer with a hole punched through it is pushed over the end of each screw. A washer and a nut are run on each screw to keep the parts clamped together tightly, and the whole device is then dipped in melted paraffin. It is attached to the house by means of a clamp made of a brass strip and drilled for two small wood screws. It can be mounted conveniently under the window casing or other board protecting it from rain, and the aerial, instrument lead and ground wire are connected in the usual way.



Saving Gas

All fuel experts know that a fire several feet below the boiler shell will give much better results than a fire close under the shell. This fact induced me to try out the idea of the heat intensifier on a gas stove, as shown in the illustration. It consists of a strip of ordinary black stovepipe iron, about 3 in. wide and a couple of inches longer than three times the diameter of the hole in the grate, which will be about 20 in. in most cases. The ends are fastened together with rivets or small stove bolts and several notches are cut in one edge. This ring is placed over the gas-burner holes, with the notched side up, and the cooking vessel is placed on top of the ring. A lighted match held near any one of the notches will light the gas when the tap is opened. The use of such a ring concentrates the heat under the vessel and consequently reduces the consumption of gas.—James E. Noble, Toronto, Can.

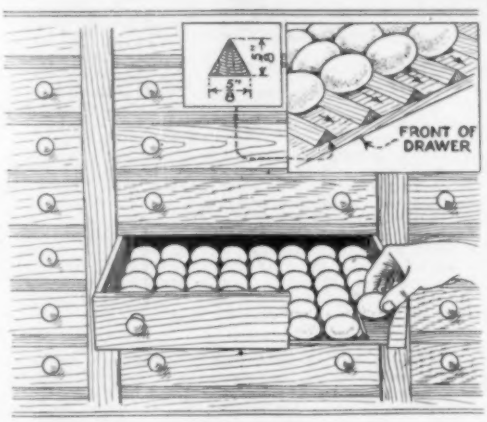
¶ An excellent substitute for a sponge may be made of several yards of cheesecloth, rolled into a ball.

Removing Developer Stains

The amateur photographer who does his own printing and developing frequently finds his fingers and nails becoming deeply stained, especially if he uses a pyro developer for films and plates. A formula for a hand wash that will remove these stains is as follows: Potassium cyanide, 70 gr.; iodine, 50 gr.; water 16 oz. After using this solution the hands should be washed thoroughly, as the cyanide is poisonous.—R. Melrose, St. John, N. B.

Compact Egg-Hatching Cabinet

In the incubator room on a Nebraska poultry farm, storage space for eggs to be hatched was very limited and therefore a compact cabinet consisting of several drawers was built along one side. The drawers were made 32 in. wide, 24 in. long and 3½ in. deep, and were subdivided by means of triangular strips of wood, measuring ⅝ in. on each side. These were tacked across the bottom of the drawers, as shown, and spaced just far enough apart to hold the eggs side by side. To prevent the eggs from rolling back and forth when the drawer is opened or closed, a small block of wood was set behind the last egg in each row. This arrangement permitted the eggs to be turned over every day by simply pulling the drawers far enough out so that they dropped downward in front, and placing the first egg in each row behind the last one, which caused the others to roll over of themselves. Thus, instead of turning over all the eggs by hand, only

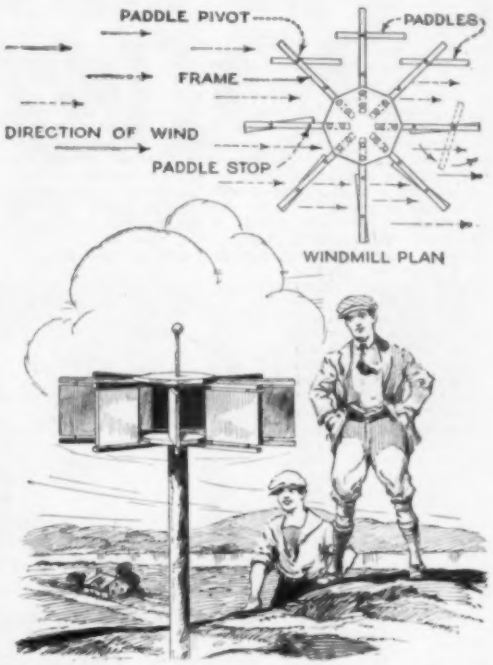


Simple and Compact Cabinet of Drawers Stores Many Eggs in Small Space

comparatively few had to be handled, saving much time.—Dale R. Van Horn, Walton, Neb.

Novel Toy Windmill

The drawing shows a novel and attractive toy windmill that can easily be made by any boy who is handy with tools. This



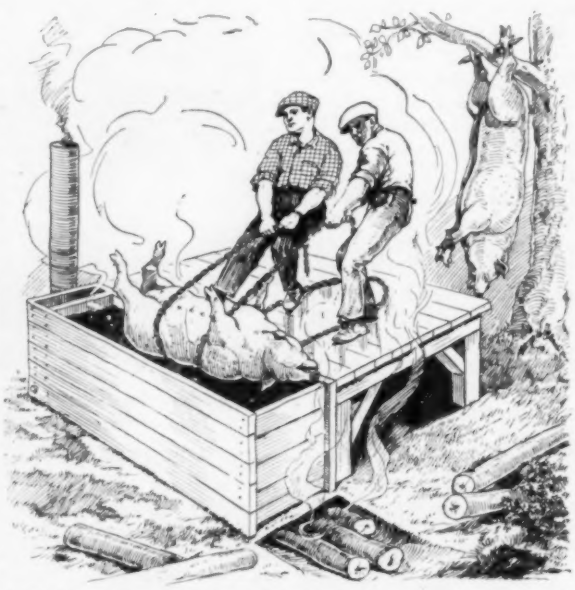
Novel Toy Windmill Turns, No Matter in Which Direction the Wind Blows

windmill differs from others in that it will revolve no matter in which direction the wind is blowing. It consists of a wooden frame and eight paddles or blades, the whole being pivoted on a post to turn easily. The plan of construction is shown in the upper detail. The frame consists of two eight-sided pieces of wood of the same size, each having eight square wooden spokes screwed to it, equally spaced apart. The paddles are square pieces of wood pivoted between the spokes of the upper and lower sections of the frame. The pivots are located off center in the paddle at directly opposite points in the upper and lower edge, and, of course, alike in all the paddles. Stop pins are also provided to prevent the paddles from swinging around entirely. These points are all indicated in the detail, which should be followed carefully to assure successful operation of the windmill. The paddles must, of course, be free to turn in the slightest wind.

¶Turpentine will restore most of the original whiteness of discolored ivory.

FROM THE EDITOR'S MAIL BAG

I notice in the Jan. issue of the "Popular Mechanics" an article by Mr. J. M. Collins of Kansas City, Mo., regarding a system of scalding hogs in use by Mr. Collins. We use a vat as does every farmer in this country. But I believe I can add some pointers that will make the job even easier. In the first place we build our vat a little deeper than he does and build the end up square instead of angular. We put in the plank end so as to leave a space about two inches thick, which is filled with water to keep the end from burning out. A small hole is drilled next to the bottom of the vat to drain this little chamber in freezing weather and is plugged with a cork. By building in this manner it is easier to put up your stovepipe at the end of the pit and you can also brace the pipe against the vat. Next we put up a platform even with the top of the vat to clean the hog on. This is very useful when cleaning the head, as one can stand on the ground and work without breaking one's back. We take a log chain, about fourteen feet long, double it and lay Mr. Hog on it lengthwise of the vat. Now fold the loop end over the hog so that it just touches the platform and bring the loose ends through the loop. One man can take the loop end and pull the hog into the vat while the other fellow holds the hog from dropping in too fast. When you are ready to take the hog out, you lay the loop end down on the platform and bring the loose ends up over the hog. Now the two men stand side by side and each one puts his inside foot on a strand of the chain, picks up a loose end and by pulling together they roll the hog out of the vat. Two men can handle the largest hog this way without half trying. By giving the chains a seesaw motion while the hog is in the vat you can roll him forth and back and do as fine a job of scalding as any slaughterhouse. We find that a common thermometer is very handy and like to heat the water to 145 degrees F. An old hoe without a handle and the corners ground off is very nice to scrape the hog. We have our vat under a large tree and when we have the hog scalded we hook on a block and tackle and pull the hog up in the tree at about the right height to take out the entrails easy, then hoist him up and fasten him there. A bit of lye or wood ashes in the water helps to take off the hair and dirt.—A Yakima farmer and reader of Popular Mechanics, Yakima, Wash.



A Yakima Farmer's Method of Scalding Hogs, Using a Log Chain to Roll the Hog Into and Out of the Vat

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I would like to state that there is hardly a number that comes out that I don't find something that I can make or do in a quicker and easier way from the plan I had in view before seeing it in P. M. Even this last Feb., 1924, issue my boy saw the "Trapper Kink" and used it and found success the following morning, after going two weeks with the traps being sprung and no game. But from now on he is taking small fur animals right along. Your article on mounting a grindstone also hits me right. I am a patrolman on a 6,000-volt transmission line. I am building a log workshop and storehouse for cable, etc., and I had just got a new stone and was figuring on setting it up in the shop, and your article just came right on time. Your Jan., 1924, I used well and the lady of the house, too; the lady found "Keeping Clothespins Handy" a very great help. A guard for ax handle I also found good.

Nov., 1922. A simple wire stretcher I used for a light fence at back of house works nicely. Also used on clothesline. Loud talkers for radio receiver set. Did not use for radio, but have a very good portable phone set for patrol work, and when home I have a player piano and I used to stick my transmitter with switch locked inside of player and hook on to line and the patrols west and east of me listened in. Now I use the plumber's force cup and an old horn from a gramophone and stand it near with the transmitter inclosed in cup and they say they can hear far better. The horn gives a larger space to let sound waves enter, so that was due to P. M. A self-closing gate I put up near my well and it worked O. K. until a cow knocked it off in a bolt for freedom, but this spring I'll have another and see that it stays put, too. Aug., 1923. A simple jack for cordwood, I'll say it is, and it saved me a lot of hard work. Shop Notes for 1923. Bottle cap to prevent bolt from turning. I used this on a buggy and several other jobs and found it did the trick. "Dogs Aid in Sawing Wood." Put that on a ready-made sawhorse and now the boys use it alone instead of two, as formerly. An improved stone boat I found, and so did my neighbors, a great labor-saving device. There are dozens and dozens of various things I have made and used, or got tips and help on from P. M. and Shop Notes, and had I the money to buy more tools and shop equipment I would have made many more articles for use around the home. I think P. M. is the best of its kind to any one that is interested in doing little things for himself, and I know only too well many a long winter evening passes in thorough enjoyment in going over the few old copies I have and one Shop Notes, 1923, and I am intending to have the whole sixteen this year. I am now sending for six of the very first back numbers and will anxiously await their coming. P. M. and Shop Notes can't be beat anywhere for the good news that they contain and the price they sell at and I for one shall always have my monthly copy and yearly Shop Notes from now on. Wishing you the greatest success with the most interesting books on mechanics I know of.—Jack Richards, Lac-du-Bonnet, Manitoba, Can.

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Made the oil burner described some time back and used it with marked success, both in a cook stove and in a small laundry stove of the globe heater style.—G. H. Allen, Toronto, Ontario.

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